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United States
Department of
Agriculture

Forest
Service

Washington, D.C.



Report of the Forest Service

Fiscal Year 1980

UNITED STATES DEPARTMENT OF AGRICULTURE

REPORT OF THE FOREST SERVICE

FISCAL YEAR 1980

February 15, 1981



Reply to: 1380 Reports

Date February 1981

Subject: FY 1980 Report of the Forest Service

To: The Secretary

Thru: Assistant Secretary for Natural Resources and Environment

I am pleased to transmit the Report of the Forest Service for the 1980 fiscal year, which describes our progress in carrying out the 1975 Program promulgated according to the Forest and Rangeland Renewable Resources Planning Act.

It has been 75 years since the Forest Service was established in the Department of Agriculture and given responsibility for administering the National Forests. In the intervening years, the National Forest System has been enlarged to 187 million acres (190 million with the addition of the Alaska lands early in fiscal year 1981), and the Forest Service mission has been statutorily broadened to address related needs for forestry research and cooperative forestry assistance to private landowners as well. We can see the fruits of these forestry programs in the improved condition and better productivity of public and private forests and rangelands throughout the Nation, but the future holds even greater promise and continued challenge

Two emerging trends in 1980 portend these challenges ahead. One is the growing importance of our Nation's forest and rangelands to the American people. These lands are looked to as sources of energy, water, timber, recreation opportunity, food, fish and wildlife, and other essential resources. Demands for most of these uses will grow rapidly over the next 50 years, as our Nation's population and economic activity increase.

A second emerging trend is our Nation's growing role as a source of resources and expertise to meet world resource needs. The recent Global 2000 Report to the President is among several studies which suggest a trend toward progressive degradation of the earth's resources, and an erosion of their capacity to support life, unless the United States and other nations act to relieve world poverty and hunger, stabilize population, and enhance economic and environmental productivity.

These trends indicate growing pressures upon U.S. and world resources, requiring additional knowledge, improved resource management, and long-term investments to enhance resource productivity in the United States and in other nations.

Fortunately, the Forest Service has several significant programs underway which help address those needs, and we made considerable progress in those programs during the 1980 fiscal year. The following pages contain my report of our major activities and accomplishments in those and other Forest Service programs. But the full significance of those accomplishments lies in the many ways they are helping meet U.S. and world needs for energy, timber, recreational opportunity, and other forest and rangeland resources.



Rising oil and gas prices, for example, have prompted increased mineral exploration and extraction in rough terrain, thereby increasing the Forest Service's role in mining and leasing minerals, oil, and gas resources on National Forests and Grasslands. In fiscal year 1980, energy production from these lands was about 12.2 million barrels of oil, 220 billion cubic feet of gas, and 6.5 million tons of coal. Forest Service accomplishments in completing or administering operating plans for these energy and mineral operations were about 35 percent more than called for in the 1975 RPA.

The reemergence of wood as a popular energy source has given the Forest Service significant new opportunities to use formerly underutilized or wasted wood biomass to help meet the Nation's energy requirements. Through our free firewood program on the National Forests, over 970,000 permittees removed fuelwood equivalent to 10 million barrels of fuel oil. Through Forest Service cooperative forest management programs with the States, fuelwood equivalent to another 1 million barrels of oil was harvested from private forest lands.

Forest Service research programs may lead to further studies in using wood biomass for energy. For example, Forest Service researchers have shown that fast-growing eucalyptus species can produce about three cords of wood per acre each year on land that is currently unproductive. A continuing research program is developing guidelines for growing and harvesting these trees for biomass energy farms and paper production. Other Forest Service research seeks to improve the energy efficiency of wood as a fuel or construction material, as well as to improve the energy efficiency of wood product manufacturing processes.

To address the Nation's timber requirements, we have pursued several opportunities for improving forest productivity on all commercial forest lands. An ongoing study, cosponsored with the Forest Industries Council, indicates that there are economic opportunities for intensive forest management on 168 million acres of commercial forest land--about 35 percent of the Nation's total. With intensive forest management on these areas, the net annual growth of timber could be increased by a volume roughly equal to three-fifths of the total net timber growth in 1976. Achieving this growth, however, requires long-term investments in forest management; investments over the several decades necessary for their effects to be realized.

We have made such long-term investments in timber management on the National Forest during 1980. For the third straight year, reforestation and timber stand improvement efforts on the National Forests have exceeded 400,000 acres each. Much of this work was done by Young Adult Conservation Corps (YACC) personnel and others from Forest Service human resources programs. With that assistance, the overall 1980 Forest Service silvicultural accomplishments were the second highest in our agency history, exceeded only by those for 1979.

More than 12.4 billion board feet of National Forest timber was offered during 1980, exceeding the timber sales target funded by Congress. To increase the

The Secretary

Thru: Assistant Secretary for Natural Resources and Environment

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opportunity for larger timber harvests in subsequent years, we have expedited the land management planning process for those National Forests where departures from non-declining flow are most likely to be justified.

The Forest Service has worked with the States to accomplish a great deal in rural forestry assistance. Accomplishments in this program far exceeded the funded targets in all but one activity; timber stand improvement assistance fell short of its funded target primarily because of constraints on herbicides available for forestry purposes. Technical assistance provided for timber management resulted in harvesting 211 million cubic feet of timber, about 10 percent above the 1980 funded target.

Forest Service research programs also are helping stretch timber resources. The Forest Products Laboratory, which is the focus of much of this timber utilization research, has developed a press-drying process which allows paper manufacturers to use 100 percent hardwood pulp for linerboard, permitting expanded use of hardwoods and easing the demand for softwood species. This process also permits papermakers to use less refined, high-yield pulp without sacrificing product performance. Another benefit is the greater efficiency of the press-dry process.

Similarly, the Forest Service role in providing recreational opportunity is growing. About 90 percent of all Americans live within 200 miles of a National Forest or Grassland. Because Americans are looking for more energy-efficient recreational opportunities, recreational use of the National Forests and Grasslands is increasing. Both dispersed recreation and the use of developed sites were significantly greater in 1980 than in previous years, despite the reduction in services that reduced funding caused at some sites. The National Forests and Grasslands provided nearly a third of the total recreational use on all Federally administered lands during fiscal 1980.

In the past 2 years, we have made a special effort to expand the trails system on the National Forests. At the end of fiscal year 1980, the Forest Service had 301 National Recreation Trails totaling over 3,500 miles, or over 60 percent of all trails so designated. National Forest System lands contain portions of eight National Scenic or Historic Trails, of which two--the Pacific Crest and Continental Divide National Scenic Trails--are administered by the Forest Service. The objective of our trail management program is to develop and maintain a system that provides a full spectrum of trail-related recreation opportunities commensurate with land capabilities and public need.

As our Nation's global resource role has expanded, so too has Forest Service cooperation with other nations in international forestry efforts. Forest Service scientists and specialists are increasingly called upon to furnish technical support to U.S. assistance programs for developing nations. During the 1980 fiscal year, several Forest Service scientists provided technical advice to overseas missions of the Agency for International Development (AID) and the Food and Agricultural Organization of the United Nations (FAO).

This past year we agreed to enlarge this cooperation by establishing and managing a national technical support network for AID's worldwide forest

resource management program. Since AID has a similar agreement with the Peace Corps, our agreement will link AID funds, Peace Corps Volunteers, and Forest expertise in a coordinated international forestry assistance effort.

At our field units and Washington headquarters, we also trained foreign nationals sponsored by AID or FAO, and hosted visitors from more than 30 nations who wished to observe U.S. forest practices and forestry operations. In support of foreign-based research on problems important to the United States, Forest Service scientists collaborated with foreign scientists on subjects ranging from tree genetics to pest management. Also a Forest Service scientist served as co-chairman of the President's Interagency Task Force on Tropical Forests, which issued its report in May 1980 with a recommended course of action for the United States to address the problem of tropical deforestation.

We are working closely with Canada and Mexico to address several areas of mutual interest and concern. For several years, we have been informally cooperating with the Canadian government in fire research and management. We hope soon to formalize this cooperation. We are working with Canadian scientists and forest managers to manage spruce budworm infestations which plague forests of both our nations.

With the University of Arizona, the Forest Service is cooperating with Mexico in an ongoing watershed management research program, and we are working with other agencies in a cooperative program with Mexico to learn more about the process of desertification, and to combat it in both our countries.

Those are some highlights of the accomplishments detailed in this report.

This report is the last which addresses the needs and actions outlined in the 1975 Renewable Resources Assessment and Forest Service Program.

In June 1980, we released the 1979 update of the Assessment and the new Program for Forest Service activities over the next 5 years. Future reports, therefore, will address the goals and objectives of that 1980 Program as modified or accepted by the Congress.

However, the trends and needs identified in the 1975 assessment have remained basically the same in the 1979 update. The 1979 RPA Assessment concludes that, while current management trends will bring about steady increases in supplies of goods and services from U.S. forests and rangelands, demands on those lands will increase at a considerably greater rate. Consequently, prices for many goods and services will increase.

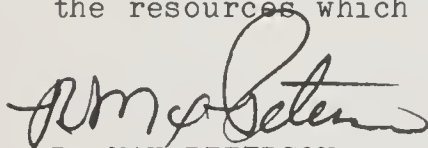
Increasing and extending the supplies of renewable resources to meet these projected demands are technically feasible. And we can accomplish these goals while maintaining a clean and healthy environment and sustaining the land's capacity to produce. However, this will require that more of the productive potential of these lands be realized, and that we increase our national investments in a variety of public and private forest management,

Thru: The Secretary
Assistant Secretary for Natural Resources and Environment

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research, and assistance programs. Basically, these opportunities involve more intensive management of all resources from public and privately owned forests and rangelands, more effective financial and technical assistance to owners of nonindustrial private lands, and research which is targeted to the vital problems and primary opportunities identified in the Assessment. Our 1980 Program addresses those needs at levels which are economically justified.

As the Forest Service, now 75 years old, looks back at the progress in its past and ahead to the challenges in its future, Gifford Pinchot's words are even more important today: "The conservation of natural resources is the key to the future. It is the key to the safety and prosperity of the American people, and all the people of the world for all time to come. The very existence of our nation, and all the rest, depends on conserving the resources which are the foundations of its life."



R. MAX PETERSON
Chief

Enclosure

PREFACE

Congress, in 1974, enacted the Forest and Rangeland Renewable Resources Planning Act (RPA). The Act directs the Secretary of Agriculture to develop a long-range program for the Nation's renewable resources that will assure an adequate supply of forest and range resources in the future while maintaining the integrity and quality of the environment. The Act is amended by the National Forest Management Act of 1976, the Cooperative Forestry Assistance Act of 1978, and the Forest Renewable Resources Research Act of 1978.

The Secretary of Agriculture is required by the Resources Planning Act to submit an annual report to Congress. By evaluating the component elements of the Program, the report provides information to aid Congress in its oversight responsibilities and to improve the accountability of agency expenditures and activities. Amendments to the Act require additional reports. Also required are:

- a description of the status of major research programs, significant findings, and how these findings will be applied in National Forest System management.
- a description of the cooperative forestry assistance programs including status, accomplishments, needs, and work backlog.
- report progress of incorporating the legislatively required standards and guidelines in the land management plans for units of the National Forest System.
- an identification on a representative sample basis of advertised timber sales made below the estimated expenditures for such timber.
- a report identifying the amount and locations by Forests and States and by productivity class, where practicable, of all lands in the National Forest System where objectives of land management plans indicate the need to reforest areas that have been cutover or otherwise denuded or deforested, and all lands with stands of trees that are not growing at their best potential rate.
- an estimate of the sums necessary to be appropriated, to replant and otherwise treat an acreage equal to the acreage to be cutover that year, plus a sufficient portion of the backlog of lands found to be in need of treatment to eliminate the backlog within the 8-year period.
- to submit an annual report on the amounts, types, and uses of herbicides and pesticides used in the National Forest System, including the beneficial or adverse effects of such uses.

This report includes other reports required to be submitted to Congress at the time of the annual report.

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INTRODUCTION

The Forest Service, U.S. Department of Agriculture, provides leadership in forest management, conservation policies, and programs worldwide. To carry out this responsibility, the Forest Service engages in a wide variety of activities that fit into four major categories:

- Administering 187 million acres of Federal land within the National Forest System;
- Providing financial, technical, and related assistance to State Forestry organizations and other cooperators through State and Private Forestry programs;
- Developing technology and information to improve protection, management, and use of renewable natural resources on lands of all ownerships through a research program; and
- Participating in several cooperative programs that provide employment, training, and work experiences for young, elderly, and economically disadvantaged persons.

The year 1980 marked the 75th anniversary of the birth of the Forest Service. Much has been accomplished during those 75 years, but, as attested by the Assessment and Renewable Resource Program prepared under the Resource Planning Act (RPA) as amended, much remains to be done.

Fiscal year 1980 is the last year of the first RPA Program period (1977-80) and the accomplishments reported here are tied to that program. This report is a summary of the actions of the Agency over the past year.

Financial Statement

The Forest Service receives operating funds through the Congressional appropriation process and from a variety of cooperator deposits. Receipts are generated from such Forest Service operations as timber sales, grazing fees, and mineral leases and permits. Twenty-five percent of Forest Service receipts are returned to States and counties that contain National Forests and Grasslands.

Receipts for fiscal year 1980 totaled \$1,288,475,000 against expenditures of \$2,071,514,000; \$280,295,427 is being returned to States and counties (appendix tables A 1.1 and A 1.2, pages 68 and 69).

Personnel

An essential ingredient in work accomplishment is people, people with the necessary skills to achieve objectives. In 1980 the Forest Service employed 21,341 full-time personnel, 17,001 of whom are employed in 29 major occupational series (appendix table A 2.1, page 70). ^{1/} The roster

^{1/} A major occupational series is defined as a series having 100 or more full-time personnel, series 434, plant pathologists, excepted.

includes about 6,011 foresters and other resource specialists, 1,069 engineers and accountants, 2,003 administrative personnel, 1,285 clerical personnel, and about 6,633 technical personnel of various skills. A variety of other people, such as archeologists, criminal investigators, analysts, and economists make up the remaining work force (appendix table A 2.1).

From 1975 to 1980, the number of persons employed has increased 7 percent, 11 percent for the 29 major occupational series (appendix table A 2.1). New and revised legislation passed since the late 1960's has had a significant effect on the makeup of this work force. The need to provide a balanced approach to land management has induced a 26 percent increase in resource supporting personnel such as wildlife biologists, soil scientists, and hydrologists (appendix table A 2.1). Management planning providing more effective decisionmaking has required a 68 percent increase in computer specialists. A 26 percent increase in contracting and procurement personnel is the result of tightened procurement regulations.

The shifts in staffing reflect an additional emphasis on intensive management including increased concerns for environmental quality and greater resource productivity, responses to rapidly changing issues, and basic managerial requirements of planning, decisionmaking, and accountability.

A positive approach to public service is being enhanced by the recently implemented HOST Program. The program is designed to improve Forest Service responsiveness and courteousness in the consumer-related activities of operations, policies, and procedures. Management and supervisory commitment is being supported by employee training in areas of awareness, letter writing, telephone courtesy, and people-to-people relations.

Land Management Planning

The National Forest Management Act (NFMA) directed the Forest Service to develop an integrated land and resource management plan for each administrative unit of the National Forest System by 1985. Regulations developed according to the NFMA will guide land and resource management planning on the 187 million acres of National Forest System lands. Locally obtained information will provide the basis for management direction established at the National, Regional, and designated Forest planning areas.

Nine Regional Plans are under preparation which will implement the 1980 RPA Program Update and provide a link between RPA and Forest, State and Research planning. All Regions will issue Draft Environmental Statements (ES) and Plans in early 1981 for public comment.

Forest Plans are under preparation for all land (120 administrative units) in the National Forest System. The first draft Forest Plan/ES (Lolo National Forest, Missoula, Montana) was filed with EPA in April 1980. The Forest Service is committed to the development of all Forest Plans by December 1983. Appendix B 2 (pages 74 through 77) contains a listing of Forests and target dates.

NATIONAL FOREST SYSTEM PROGRAM

Introduction

The Forest Service is responsible for the management, protection, and use of the 187-million-acre National Forest System (as of September 30, 1980) (appendix table B 1.1, page 72). These Forests provide a sustained flow of renewable resources including recreation opportunities, wood, forage, wildlife habitat, and water. Minerals, including energy resources and hardrock minerals, are also produced.

The System encompasses nine Regions containing 154 National Forests, 19 National Grasslands, and 17 Land Utilization Projects located in 44 States, Puerto Rico, and the Virgin Islands (figure 1, page 4). The natural resources on these lands are some of the Nation's greatest assets. They have major economic, environmental, and social significance to millions of Americans now and in the future.

The 1975 RPA Program provided overall direction for the management of the National Forest resources for the period 1977-1980. The general direction and intent of the program have been followed, although some specific targets have not been fully accomplished. Most funded program targets for fiscal year 1980 have been met and in many areas exceeded (table 1, page 5). The percentages of accomplishments are provided as are the equivalent budget line item costs. The latter provides approximate cost effective data for each Forest Service resource system and support element. Discussion of the key outputs and other program information follows.

RECREATION AND WILDERNESS MANAGEMENT

The recreation management goal of the Forest Service is to manage National Forest System lands so that quality recreation experiences and related services are accessible to all Americans.

The RPA Program recommended increasing the supply of outdoor recreation opportunities and services through Forest Service programs that emphasize the opportunities to learn and experience nature and our national heritage. Under this program, dispersed recreation (those activities that occur outside of sites developed and managed for concentrated recreation use) would increase in the next two decades, and the Forest Service would maintain its share of developed or concentrated site recreation.

Recreation Activities

Recreational activities in the National Forest vary from camping in constructed facilities to interpretive exhibits and talks (appendix tables B 3.1 through B 3.6, pages 78 through 85).

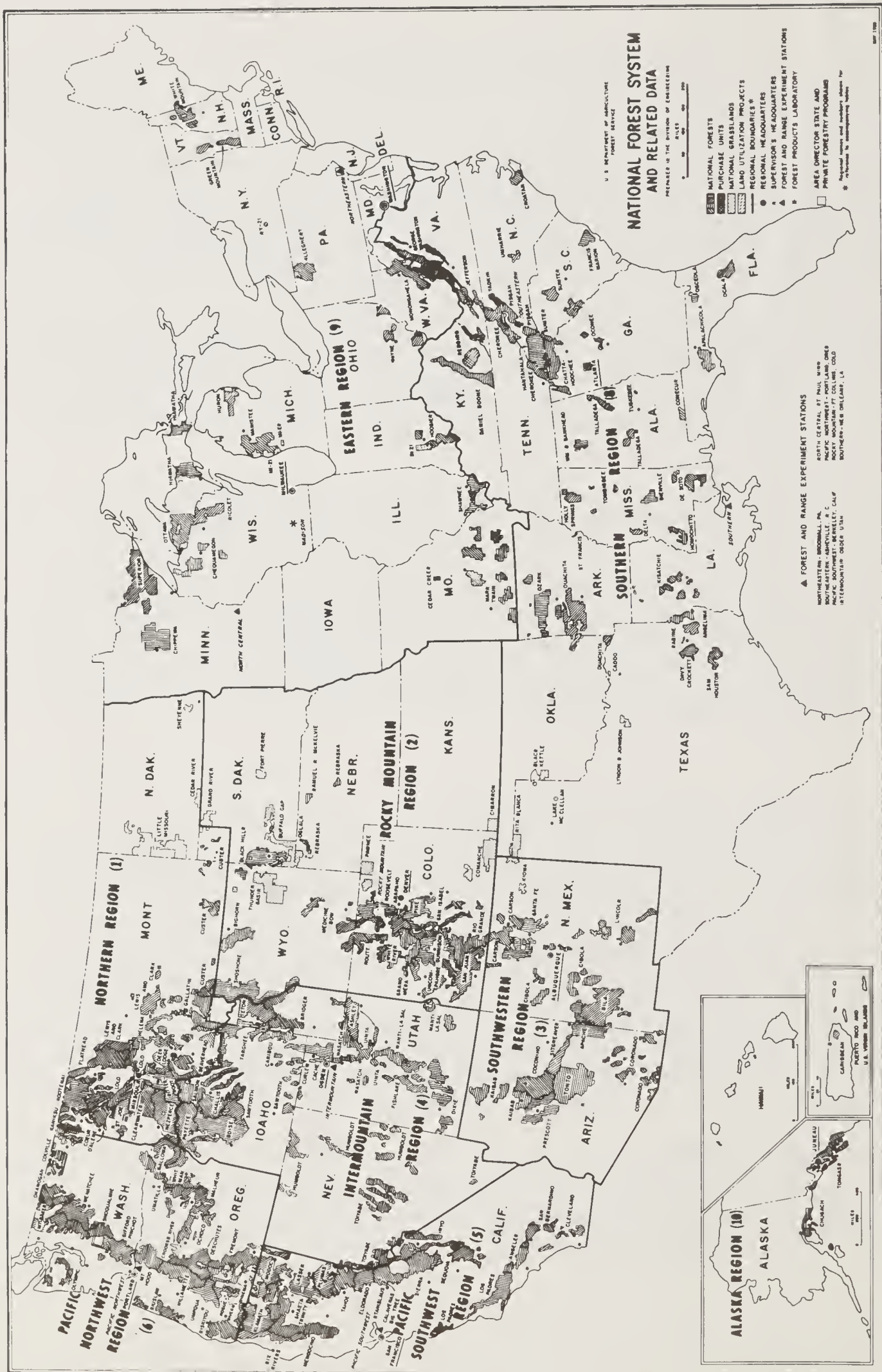


Figure 1.--National Forests and other lands administered by the Forest Service

Table 1.--Summary of National Forest System key output accomplishments compared to RPA estimates and funded targets--fiscal year 1980

Key output	Unit of measure	RPA targets		Funded target	Accomplishment ^{1/}	Changed from funded target	Percent of funded target	Cost 2/ (Dollars in thousands)
		High	Low					
RESOURCE								
Recreation	Visitor use	221.0	203.1	212.2	233.5	+	21.3	98,440
Wilderness	Maintenance	15.2	15.2	19.0	17.6	-	14.5	3,391
Wildlife and fish	Habitat improvement	1,061.0	976.0	567.0	641.0	+	74.0	38,780
	Permitted livestock							
Range	Timber Sales	16.3	15.4	12.1	9.8	-	2.3	35,367
	offering	14.6	13.5	12.2	12.4	-	-	141,537
	Silvicultural exams	8.9	8.9	8.2	7.7	-	0.5	22,278
	Reforestation							
	Appropriated funds	347.0	299.0	220.0	229.0	+	9.0	53,896
	K-V funds	289.0	289.0	205.0	204.0	-	1.0	55,100
	Timber stand improvement							
	Appropriated funds	807.0	722.0	276.0	299.0	+	23.0	36,374
	K-V funds	304.0	304.0	164.0	158.0	-	-	19,900
Soil and water	Resource improvement	100.0	100.0	29.2	37.8	+	8.6	47,255
Minerals	Leases and permits	--	--	15,865.0	21,508.0	+	5,643.0	15,442
SUPPORT								
	Trail construction/reconstruction	1,270.0	1,270.0					8,150
	Road construction							
	Appropriated funds	2,777.0	2,563.0	780.0	923.0	+	143.0	158,340
	Purchaser credit	7,338.0	6,774.0	10,250.0	9,561.0	-	689.0	226,075
	Number of man-caused fires							
	Fuel management	6,240.0	5,760.0	431.0	761.6	+	319.6	22,080
	Land acquired	592.0	547.0	442.0				14,100
	and exchanged							
	Landline location	304.2	208.8	76.9	75.8	-	1.1	7,030
		4.4	4.1	6.3	6.2	-	0.1	21,552

^{1/}Accomplishments by participants in the human resource programs are included.

^{2/}The costs shown are total available dollars for the budget line item and include both management and investment costs. The figures do not include support dollars included in other budget line items. The figures are from the 1981 Budget Explanatory Notes.

^{3/}Accomplishment includes 1,541 miles turned back to Forest Service for construction.

In 1980 the 147.9 million recreation visitor-days of dispersed recreation on the National Forests represented an increase of 9.6 million visitor-days or 6.9 percent over last year, and exceeded the RPA expected use estimate of 130-140 million visitor-days.

Recreation use at National Forest developed sites was about 5.7 percent higher than the 1980 high level RPA estimate (appendix tables B 3.1 through B 3.6). The 85.6 million visitor-days of recreation use took place at 4,775 campgrounds, 1,553 picnic sites, 313 swimming sites, 984 boating sites, 738 interpretive and informative sites, 468 observation sites, and 233 miscellaneous sites.

Reduced levels of service were provided at selected areas due to funding constraints. All recreation sites were kept open, and every effort was made to reduce cost and conserve funding to cover the essential needs.

Off-Road Vehicles

Executive Orders 11644 and 11989 directed the Federal land management agencies to develop a policy to manage use of off-road vehicles (ORV's). Off-Road Vehicle (ORV) management plans were implemented on 99 percent of National Forest System lands, and plans for the remaining 1 percent are pending. Sixty-six percent of the lands were designated open to ORV use, 13 percent were restricted to specific types of vehicles or use during specific seasons, and the remaining 21 percent were closed to ORV's.

Recreation Special Use Permits

The Forest Service has in effect about 20,000 recreational special use permits. Approximately 3,000 permits are issued to commercial permittees for various operations, almost 17,000 recreation residences are permitted to individuals and families, and over 500 organized group camps or sites are permitted. In 1980 these permittees paid fees amounting to approximately \$11 million to the United States for their privileges.

Trails

The Forest Service's commitment to providing publicly desired quality recreation opportunities, especially dispersed recreation opportunities, will depend greatly on an adequate trail system. The trail management program objective is to develop and maintain a trail system that provides a full spectrum of trail-related recreation opportunities commensurate with land capability and public need. The RPA goal is a system of 120,000 miles of trail within the National Forest by 2020. At the end of fiscal year 1980, there were 101,000 miles of trail.

The President's Environmental Message for 1979 reaffirmed the Forest Service's goal to have 244 National Recreation trails by January 1, 1980. This goal was exceeded by 12 for a total of 256 trails. At the end of fiscal year 1980, the Forest Service had 301 National Recreational Trails totaling over 3,500 miles. National Forest System lands contain portions of eight National Scenic/Historic Trails. Two of the trails, the Pacific Crest and Continental Divide National Scenic Trails, are administered by the Forest Service.

Wilderness

RARE II resulted in the Administration's recommending to the Congress that an additional 15.4 million acres of National Forest System lands be designated as Wilderness. The Congress has considered many areas on a State-by-State basis during 1980, adding 2.3 million acres to the National Wilderness Preservation System (NWPS) within the National Forest System. One Wilderness Area was added and one enlarged. The 2.3 million additional acres in 1980 brings the National Forest portion of the NWPS to 17.6 million acres (table B 4.1, page 86). This represents 82.4 percent of the total 21.4 million-acre NWPS and 9 percent of the National Forest System. National Forest Wilderness Areas received about 9.3 million visitor-days of use in 1980. This is 29 percent more than the 1980 RPA estimate, but, a slight decrease from the 9.6 million visitor-days in 1979.

Wild and Scenic Rivers

A 125-mile portion of the Salmon River in Idaho was added to the Wild and Scenic River System (table B 4.2, page 86). This brings the Wild and Scenic River designation to sections of 16 rivers (1,011 miles) in the National Forests. Recreation use on these rivers totaled about 1.9 million visitor-days in 1980, an increase of about 0.5 million visitor-days over the 1979 use.

Cultural Resources

Various legislation, and particularly the National Historic Preservation Act, directs the protection and management of cultural resources. The Forest Service is proceeding to identify, evaluate, and preserve the historic and prehistoric values found on National Forest System lands. In this effort, cultural resource specialists coordinate with other resource activities to insure that protection of the Nation's heritage is an integral part of all operations.

Four-Year Program Evaluation, 1977-1980

Situation. The 1975 RPA Program proposed increasing recreation use on National Forest lands from 201.3 to 211.0 million recreation visitor-days (RVD's) in 1977, to from 219.7 to 237.8 million RVD's in 1980. RPA projected costs ranged from \$77.41 million in 1977, to \$134.80 million in 1980.

Funds appropriated (in constant 1978 dollars) for the recreation program increased at an annual average rate of 6 percent to a total increase of 20 percent, from \$77.41 million in 1977, to \$92.7 million in 1980. Actual use increased 14 percent during the evaluation period, at an annual average rate of 5 percent.

Full service management of recreation sites has declined 12 percent and reduced service management increased 23 percent from 1977 to 1980.

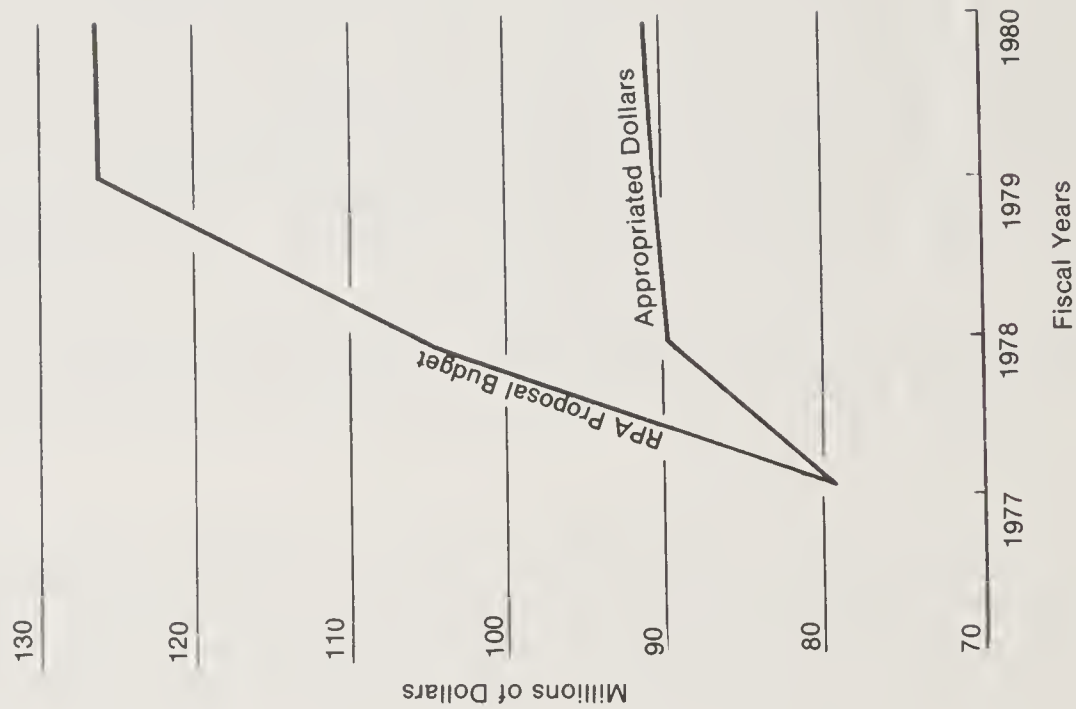
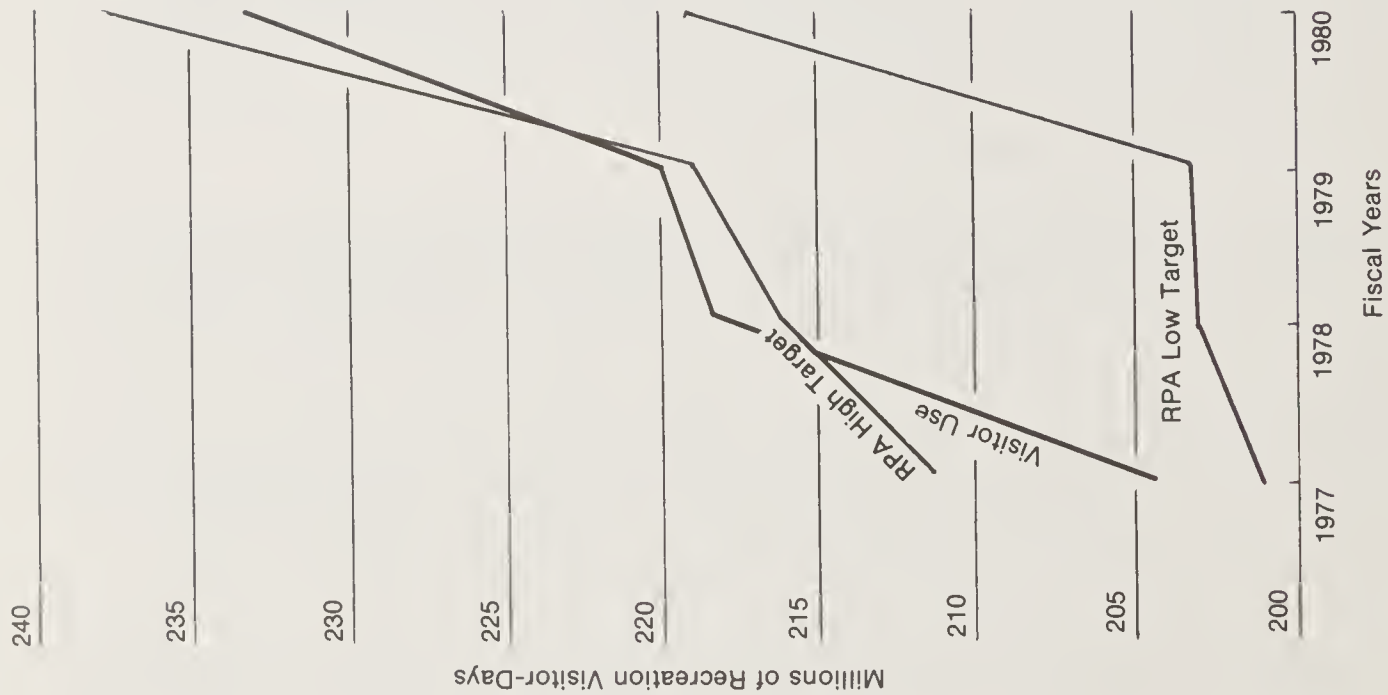


Figure 2.--Comparison of recreation use with RPA targets (left) and funding (right)--fiscal years 1977-1980

Evaluation. Actual recreation use followed closely the 1975 RPA high range projection, with funding at approximately 68 percent of the RPA projected need. Increased use has occurred and will continue, regardless of funding levels, since use is not a direct or indirect consequence of management action. Results of this situation are a lower quality recreation experience, damage to government property and deferred maintenance on capital investments, and failure to comply with health and safety laws and regulations. A specific example of this situation is the recent GAO study which indicates that considerable work backlog is necessary to bring many National Forest recreation facilities into compliance with health and safety regulations.

Appropriated funding for the recreation program has increased, while funds available at the project level have declined. Increased costs are associated with land management planning and environmental coordination. An example is the shift in service provided the public from full to reduced management while recreation environmental assessments related to timber sales has increased.

The current systems of measuring accomplishment and use are useful but not totally effective for the purposes to which they are being put. Though RVD is a practical measure of use, it should have no direct relationship to the budget, because it is an uncontrollable factor. Another measure, PAOT days (people at one time capacity for the season), defined at full and reduced service levels of management, provides a means of quantifying operational programs. But neither of these systems fully relate to the management needs. An evaluation of management needs and current systems is presently underway.

WILDLIFE AND FISHERIES MANAGEMENT

Wildlife and Fisheries Management programs are designed to assure suitable habitat for a balance of wildlife and fish populations; to cooperate with State and Federal agencies in habitat management; to provide habitat and protection for endangered and threatened species; and to assure other resource management programs adequately consider wildlife and fish habitat values.

Public demand continues to increase for opportunities to enjoy wildlife and fish for hunting, sport fishing, commercial fishing, and nonconsumptive (viewing) use. Recent legislation and Forest Service policy require maintenance of viable populations of all species, and providing for the recovery of threatened and endangered species. The Forest Service Wildlife and Fisheries program is designed to help meet these demands through land and resource management planning coordination with other resource activities, wildlife and fish habitat improvements, threatened and endangered species and habitat improvements and protection and cooperation with State and Federal agencies.

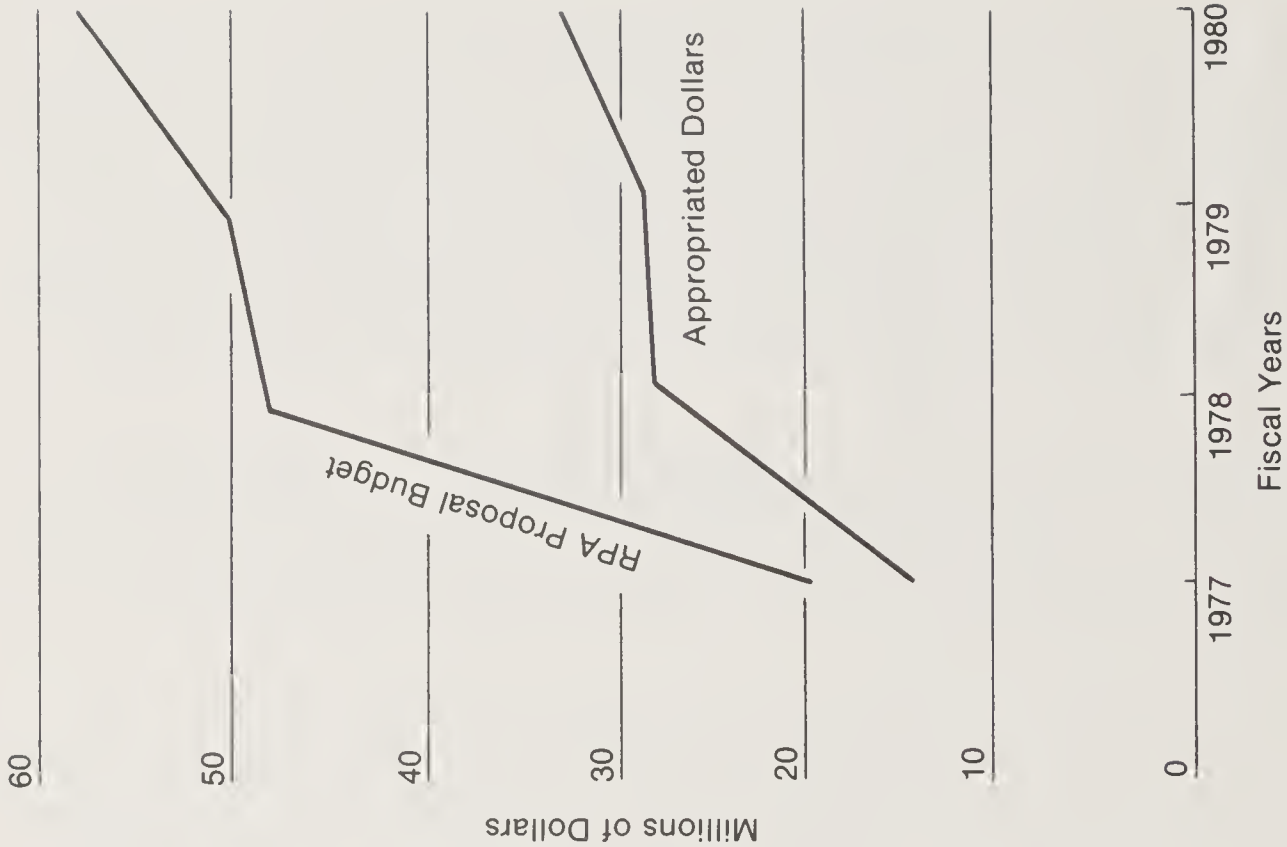
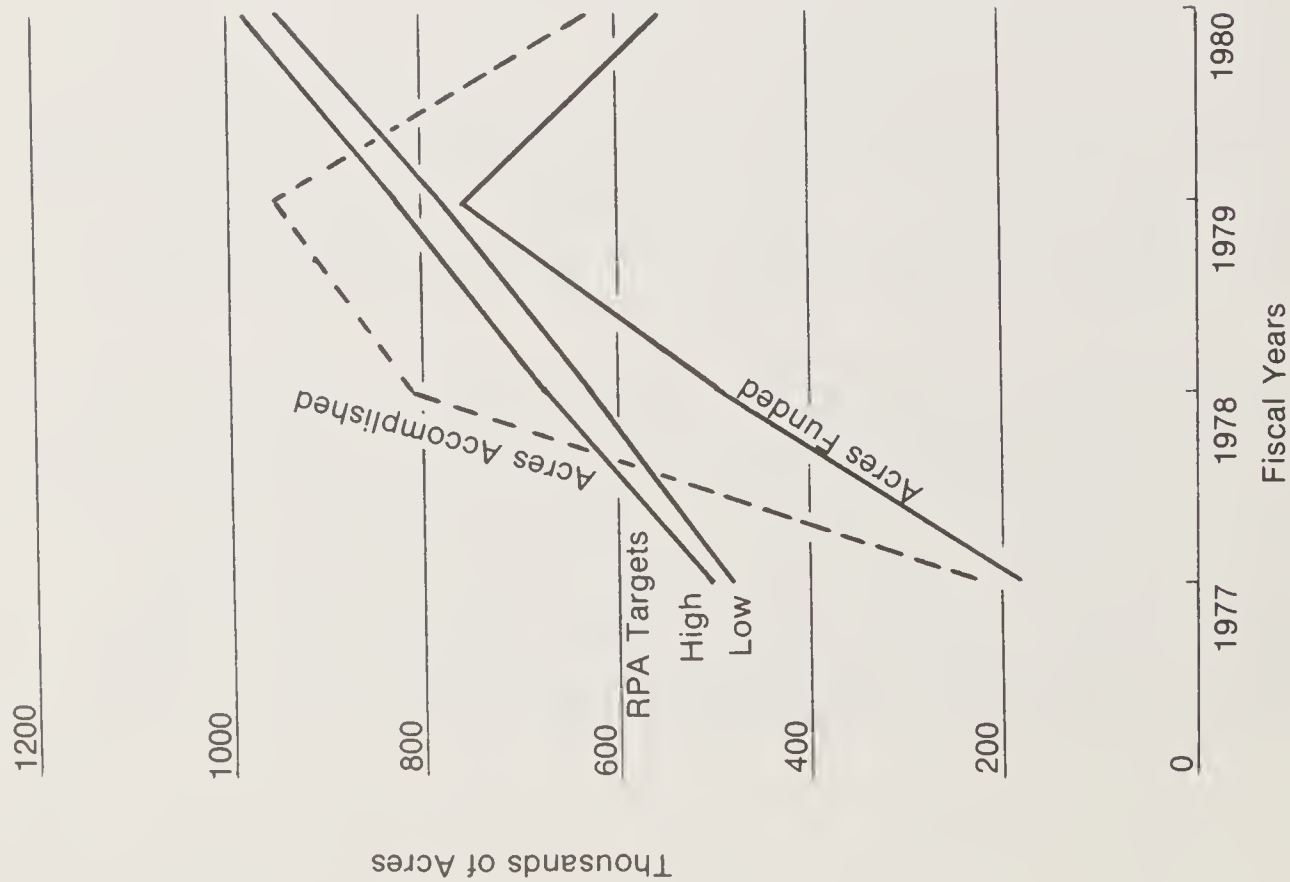


Figure 3.--Comparison of wildlife and fisheries habitat improvement acreages with RPA targets (left) and funding (right)--fiscal years 1977-1980

Habitat Improvement

Fish and wildlife habitat improvement targets for fiscal year 1980 were about 567,000 acres. Improvement was accomplished on 641,000 acres, 13 percent more than the planned target. Accomplishments included 545,000 acres for wildlife habitat improvement, 23,000 acres for fish habitat improvement, and 73,000 acres for threatened and endangered species habitat improvement. About 15 percent of this work was accomplished with timber sale area improvement deposits (Knutson-Vandenberg Act) funds (appendix tables B 5.1 and B 5.2, pages 87 and 88).

Recreation associated with wildlife and fishing activities accounted for 34.2 million recreation visitor-days of use on the National Forests, including nonconsumptive use of wildlife and fish (such as nature study).

Special emphasis has been given to the development of the fish and wildlife habitat relationships program. Federal and State agencies are cooperating in developing this program to provide information on all fish and wildlife species for planning at Forest, Regional, and national levels.

Four-Year Program Evaluation, 1977-1980

Situation. The 1975 RPA Program proposed an increasing program for wildlife and fish, increasing investments in habitat improvement from 487 to 513 thousand acres in 1977, to 976 to 1,061 thousand acres in 1980. RPA projected costs (in constant 1978 dollars) ranged from \$19.56 million in 1977, to \$63.45 million in 1980.

Funds actually appropriated (1978 dollars) increased from \$14.95 million in 1977, to \$32.5 million in 1980, an increase of 117 percent. Accomplishment of habitat improvement work increased from 218 thousand acres in 1977, peaked at 974 thousand acres in 1979, and went to 641 thousand acres in 1980, a net change of 194 percent. Of the total RPA high range target, 86 percent was accomplished.

Evaluation. Increased program emphasis and funding have augmented the overall effectiveness of the Wildlife and Fish Program. Habitat improvement work has been conducted on increasing acreages of National Forest land. Improved coordination and planning efforts are resulting in increased wildlife benefits from other programs, such as timber. Efforts to protect and enhance threatened and endangered species have resulted in more effective protection measures.

RANGE

The goals of range management within the Forest Service are (1) to provide livestock range forage to the extent benefits are commensurate with costs, without impairing land productivity; (2) to improve and maintain environmental quality of rangelands by managing the grazing in harmony with the needs of other resources; (3) to exert a favorable influence on associated

private and other related lands; and (4) to contribute to the maintenance of viable rural economics by promoting stability of family ranches and farms in the areas of which the National Forests and National Grasslands are a part.

Forage Production and Use

The 1975 RPA Program recommended increasing the 1975 level of animal unit months (AUM`s) of grazing on National Forest System land by 15 to 23 percent by 1980. In fiscal year 1980, the range program was funded at \$41.0 million with a goal of providing 12.1 million AUM`s. National Forest System rangeland produced 11.4 million AUM`s of available forage, 94 percent of the funded goal. Although 9.8 million AUM`s are authorized by permits, only 8.7 million AUM`s were used because of inclement weather, poor growing seasons, permittees` personal reasons, and other factors.

The number of grazing allotments in 1980 was 10,754, a slight decrease from 1979. Improved management was continued on 7,378 allotments and started on another 1,236 (appendix table B 6.1, page 89). Eighty percent (80%) of all range allotments are under improved or more intensive management than in 1975.

Permittees, in cooperation with the Forest Service applied conservation measures to 289,864 acres of National Forest rangeland in poor ecological condition. Cooperative forestry assisted private landowners in the improvement of about 63,000 acres of forested private range. Appendix tables B 6.2 through B 6.4, pages 90 through 92, show grazing use and range improvements.

Evaluation Programs

Rangeland evaluation programs are underway to increase range program effectiveness, to provide needed technology, and to facilitate range cooperation. Programs are in process (Grant County, Oregon; Fishlake National Forest, Utah; and the southern project including Alabama, Arkansas, Texas, Louisiana, Mississippi, and Florida). These programs are designed to develop factual information on the interrelationships between range and other natural resources and to test assumptions made in predicting multiple resource outputs in the RPA Program.

The Public Rangeland Act provided an experimental stewardship program providing incentive or research to holders of grazing permits and leases whose stewardship results in improved range conditions. Program incentives produced to date are: (1) accelerated allotment development through range improvement practices; (2) increased forage use on National Forest ranges which help mitigate potential reduction of livestock grazing on public lands; and (3) coordinated resource management and planning on several range allotments involving BLM, Forest Service, private, and State lands.

Four-Year Program Evaluation, 1977-1980

Situation. The 1975 RPA program proposed increasing available grazing capacity on National Forest lands from 10.8 to 11.4 million AUM`s in 1977 to 15.4 to 16.3 million AUM`s in 1980. Costs projected ranged from \$27.02 million in fiscal year 1977 to \$61.03 million in fiscal year 1980 (1978 constant dollars).

Funds appropriated (in constant 1978 dollars) for the range program increased between 1977 and 1978 by 14 percent, then remained essentially constant for 1978-1980 at an annual average of \$30.07 million. These funds were to sustain available grazing capacity at an average annual program target of 10.07 million AUM`s. These resources sustained an average available capacity of 11.4 million AUM`s. Permitted capacity remained essentially constant at 9.8 million AUM`s. Utilization during the period varied from a low of 8.66 million AUM`s in 1980 to a high of 9.04 for 1977, resulting in an average unused capacity of 10 percent.

Evaluation. The 1975 RPA assessment projected a substantial long-term increase in demand and need for available forage but the projected National Forest share of this demand did not materialize in the 1977-1980 period. The average annual available but unused forage supply on National Forests was 3.1 million AUM`s. Available AUM`s have increased slightly in response to investment and management. Net result was to slightly increase available but unused capacity.

Utilization is averaging 90 percent of permitted AUM`s and 76 percent of available AUM`s. The year-to-year variation in actual use is due to various considerations of the permittees and range manager including non-use by the permittee for range protection and non-use for personal convenience.

The difference between permitted and available capacity is due to open but unused allotments that have not been stocked with livestock. The unused grazing capacity is associated with inefficient (high cost) locations, lack of local demand, and a declining sheep industry. Part of the available unused capacity is not readily accessible to existing livestock operations or is not competitive with existing ranching operations. Fifty-six percent of this surplus is in the Southeastern United States where demand for livestock grazing is insufficient to make use of it. Approximately 320,000 AUM`s are available in California, Oregon, and Washington in the form of transient forage in clearcut units often located some distance from the ranching operation, or not compatible with normal ranching operations. The remainder of the unused grazing capacity is located principally in the Central Rocky Mountain States, much of which consists of unused sheep range, a result of the long-term decline in the sheep industry.

The unused forage in the aforementioned areas is in contrast to the overgrazing problems that continue on many of the traditional western rangelands and permittees desires for more capacity on existing permits. Although consumer demand for beef has declined in recent years, many permittees would expand their herds if additional low-cost forage were

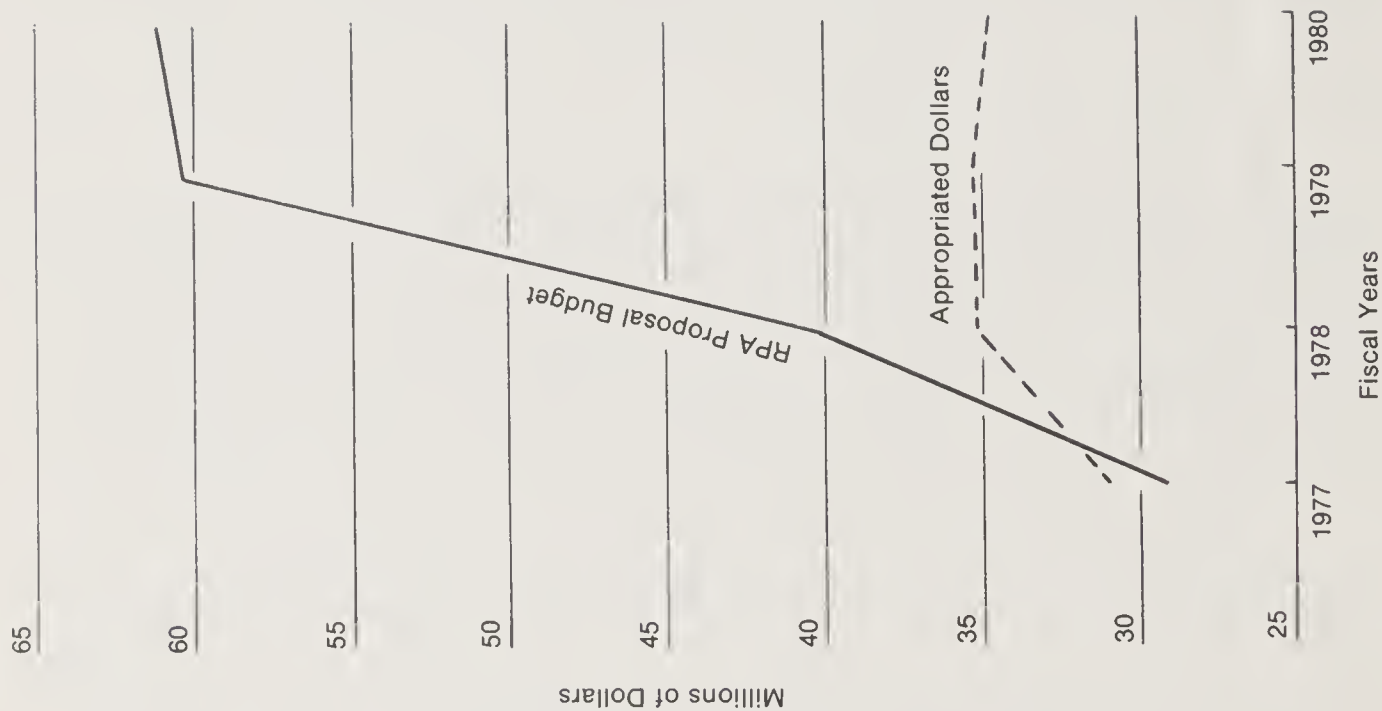
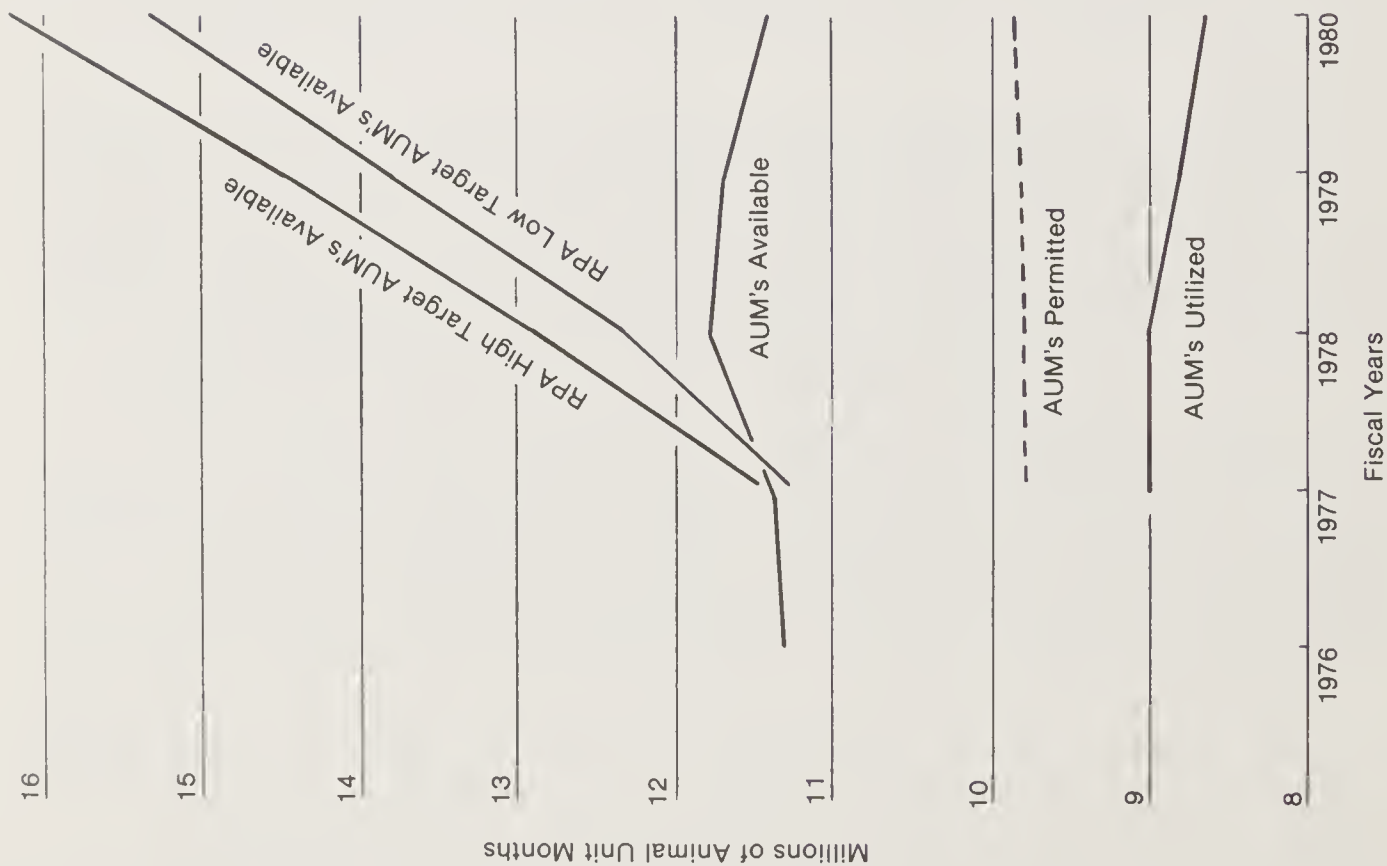


Figure 4.--Comparison of range program outputs and RPA targets (left) and funding (right)--fiscal years 1977-1980

readily available. Problems persist in some parts of the country, principally in the Southwest with unsatisfactory range conditions. Range managers are making progress in adjusting livestock use to allowable capacity.

The lack of demand for forage is the product of many factors. The cyclical decrease of cattle herds during the 1976-1980 period is a major factor, the result of normal supply and demand forces and not built in to the 1975 RPA Program. Many beef producers reduce their herds, and some marginal operators quit the business. Increasing losses to predators, and labor problems have resulted in conversion of some sheep operations to cattle, and the elimination of other sheep operations.

Stable real dollar funding of the range program has resulted in a slight decrease in the funds actually available for range management. Planning efforts directed by RPA, NFMA and other legislation are placing substantial and increasing demands on program funds, resulting in less on-the-ground management and administration.

There is no system of accumulating, at the national level, measurement of range condition on an annual basis, although individual Forests report some improvement in range conditions. The 1980 RPA assessment of National Forest System range condition was based on improved measuring and reporting techniques. This data is not comparable with 1975 RPA data for overall assessment of trend in range condition on National Forest System ranges. Available data indicate continuous improvement consistent with the trend assessment of 1967-1977.

TIMBER MANAGEMENT

Timber on National Forest System lands is managed to produce a continuous supply of wood products to serve America's many demands. Fuelwood, pulpwood logs for lumber and plywood production, Christmas trees, and poles and posts, are among the products produced through the program. Their production requires a variety of activities such as thinning tree stands to promote growth, replanting cutover areas to assure a new crop of trees, and pruning to increase lumber quality.

Sales and Administration

In fiscal year 1980, the Forest Service prepared and offered for sale 12.4 billion board feet of timber, meeting the direction funded by Congress. This was 1.1 billion board feet below the RPA goal. Funding limits, reductions in land base, and changes in land designation are the major reasons for not meeting the goals established by the 1975 RPA program. A total of 11.4 billion board feet of timber was sold (92 percent of offered volume) by the Forest Service at a value of about \$2 billion, and 9.1 billion board feet of National Forest timber was harvested at a value of \$730 million (appendix table B 7.3, page 94). Appeals and court actions challenging land use, timber plans and planned timber sale offerings continue to have major impacts on the program.

The National Forest Timber Salvage Sale Program, a highly successful program in 1979, was expanded to all National Forests. In 1980, over 63.5 million board feet of fire, insect or otherwise damaged salvage timber was sold as a result of this program. In addition, the Pacific Northwest area was particularly successful in salvaging material previously left in the woods following logging operations. Various industries purchased over 278 million board feet of logging residues.

Sample Timber Sales Including Those Below Cost

Section 6 of the Renewable Resources Planning Act requires a representative sample of advertised timber sales made below the estimated expenditures for such timber. For the selected sample of timber sales, all Government expenditures attributable to the preparation and sale, administration of harvest and assessment of timber volumes were identified and estimated. Included were costs that were incurred prior to fiscal year 1980, costs incurred during fiscal year 1980, and costs estimated to occur after fiscal year 1980 until the time all scheduled work is complete on the sales areas (appendix tables B 7.1 and B 7.2, page 93).

Also, for these selected sales, returns to the Government from the harvest of the timber were estimated. Included were the expected stumpage receipts, timber stand improvement deposits, and the constructed value of the road access.

The principal reason for selling timber below cost was (1) to salvage harvest mortality timber, (2) to improve short-range and long-term growth by meeting the silvicultural needs of individual stands of timber, or (3) to satisfy the needs of the community and the timber purchaser, who are dependent on National Forest timber sales.

Silvicultural Examination

Silvicultural examinations and site-specific prescriptions provide data for land resource management and timber resource planning. In fiscal year 1980, the examination program was funded to accomplish 8.2 million acres. Work was completed on 7.7 million acres of National Forest lands.

Reforestation and Timber Stand Improvement

Reforestation and timber stand improvement (TSI) was accomplished on 890,000 acres about 27,000 acres more than the funded program. Appropriated funds were used to accomplish 229,000 acres of reforestation and 299,000 acres of TSI. Money set aside from timber sales under the Knutson-Vandenberg Act was used to reforest 204,000 acres and to improve the stand of timber on 158,000 acres. At the end of 1980, about 1.8 million acres of National Forest System lands needed TSI treatment. The RPA target for TSI is about 400,000 acres annually (appendix tables B 8.3 and B 8.4, pages 102 through 107).

At the end of fiscal year 1980 about 1.3 million acres of National Forest lands needed reforestation (appendix tables B 8.1 and B 8.2, pages 96 and 97), or 300,000 acres less than in 1979. Work accomplished during 1980 reduced the total backlog by 300,000 acres, and offset the additional

400,000 acres acquired. More than 40 percent of the acreage to be reforested is a backlog of work that has existed for a number of years and resulted from wildfires and other causes.

Certification of reforestation and timber stand improvement acreages is shown in appendix tables B 8.5 and B 8.6 (pages 108 through 113).

Fuelwood

Interest continues to increase in the Forest Service's free firewood program. This program allows people to obtain permits to cut (free-of-charge) timber for their personal use as firewood. Over 970,000 free-use permittees removed more than 2 billion board feet of fuelwood from National Forest System land. This is a 28 percent increase over the 1979 program and will provide the heating equivalent of about 10 million barrels of fuel oil. The increased demand is causing considerable strain on the Ranger District workload because of the extra effort required to effectively administer the program, to investigate additional violations, and to deal with other resource conflicts.

Economics

Economic studies of future timber demands predict a substantial growth in lumber, plywood, and pulpwood consumption over the next two decades. In the short term, however, production of these products is uncertain because of the unprecedented high interest rates resulting from efforts to reduce inflation. Unless interest rates are reduced early in 1981, harvest levels of softwood sawtimber and other products during the next year will probably be significantly below the level of the last few years.

Stumpage rates continued to increase as they have for several years. The average national stumpage rate per thousand board feet for volume sold in nominal dollars was \$100 in 1977, \$121 in 1978, \$173 in 1979, and \$181 in 1980.

Four-Year Program Evaluation, 1977-1980

Situation. The 1975 RPA Program proposed increasing National Forest timber sale offerings from 10.4 billion board feet in 1977 to from 13.5 to 14.6 billion board feet in 1980. Projected costs in the RPA Program ranged from \$120.46 million in 1977 to \$177.31 million in 1980 (1978 constant dollars).

Funds appropriated (in constant 1978 dollars) for the timber sale program increased from \$120.46 million in 1977, to \$144.50 million in 1980, an annual average of \$134.03 million. These funds were to provide planned average sale offerings of 12.2 billion board feet. Actually, an average of 12.0 billion board feet of timber was offered, 98 percent of the planned offering, and 90 percent of the average RPA projected offering.

Timber volume actually sold increased from 9.92 billion board feet in 1977 to 11.8 billion board feet in 1979, then declined to 11.4 billion board feet in 1980. About 10.5 billion board feet were harvested in 1977,

but only 9.1 billion board feet were harvested in 1980. An average of 1.0 billion board feet per year (5 percent of total offered) was offered but not sold.

Evaluation. An overall decline in the national economy contributed to a softening in the demand for lumber and wood products, contrary to the 1975 RPA long-term projection for an increased demand and strong markets. For instance, actual Gross National Product is 14 percent less than projected for 1980, and housing starts are down 40 percent from projected levels as shown in table B 7.4, page 95. Real lumber product prices continue to increase for the long term, regardless of short-term fluctuations in the market.

Each year about 1.0 billion board feet is classified as offered but not sold. Though most softwood timber offered in Alaska, the Pacific Northwest, and the Southeast is readily sold, such is not the case in all areas. In the Northeast and central Rocky Mountains, an increasing amount of offered timber is not sold. Of this amount, 323 million board feet was actually offered but not sold. Another 234 million board feet was in deficit sales (sales offered where estimated logging and production costs exceed estimated selling values). Most of this deficit sale volume is located in the Northeast and central Rockies and consists of hardwoods and marginal softwoods. Lack of demand and distances from markets are the principal reasons for the lack of sales. An additional 250 million board feet was prepared for sale, but not offered due to "holds" imposed by appeals, court action, etc. On long-term sales, 400 million board feet was offered but not reflected in sold volumes. These situations occur annually to varying degrees and account for the annual average of approximately 1.0 billion board feet classified as offered but not sold.

While volume offered has increased at an average of 3.6 percent annually, funding for the sales program has increased at an average of 6.5 percent annually, an 8 percent increase in cost per board foot. This trend reflects the increasing cost of doing business associated with such activities as land management planning and compliance with environmental requirements.

WATERSHED MANAGEMENT

The protection of soil and water resources is an ongoing activity designed to assure future soil productivity and provide high quality water. Watershed Management includes the management of both soil and water. The soil and water program provides technical assistance to land and resource planning efforts, support and coordination to other resource activities, assistance and information to other agencies, and management of water rights including the accelerated inventory and quantification of Federal reserved water rights.

The 1980 target for the Watershed Improvement activities on National Forest System lands was 29,215 acres. With the help of Human Resource Programs, 37,839 acres were improved, 30 percent more than the target.

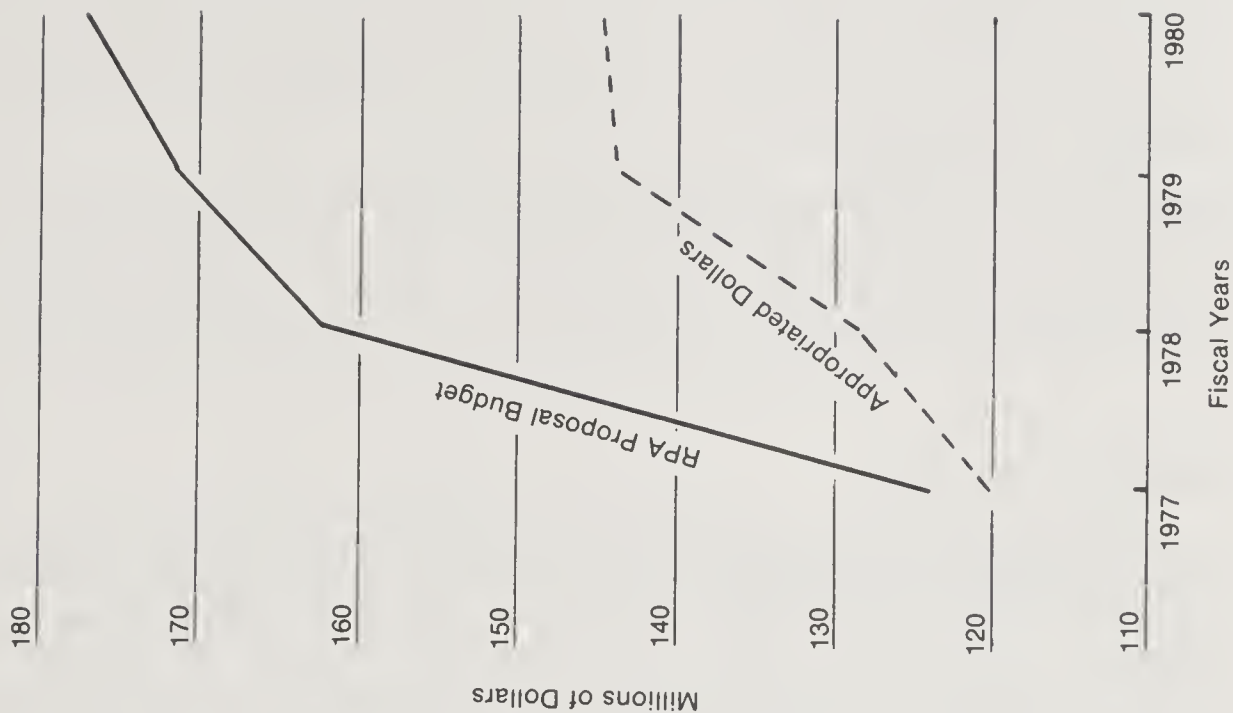
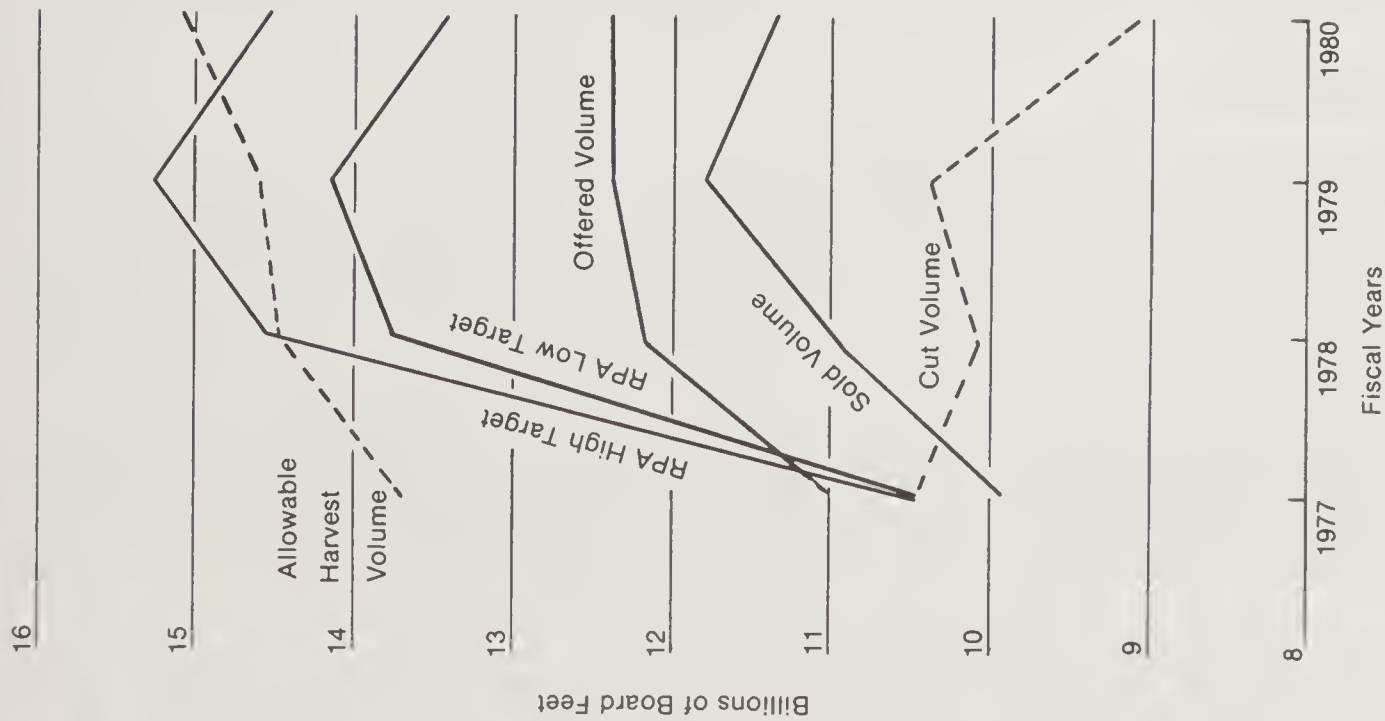


Figure 5.--Comparison of timber program outputs and RPA targets (left) and funding (right)--fiscal years 1977-1980

Soil and Water Resource Inventories provide information needed to assess renewable resources as required by RPA and provide information for the land management planning process, land allocation, and resource management activities. Soil inventory was accomplished on 16,394,405 acres of National Forest lands, 11 percent less than the planned accomplishment of 18,415,980 acres. Water resource inventory was accomplished on 19,338,000 acres of National Forest land, 7 percent more than the planned program of 18,060,000.

Rehabilitation of National Forest lands burned by wildfire is an important part of the soil and water management job. In 1980, 108,724 acres of burned-over National Forest land on 22 separate tracts was rehabilitated through such activities as reseeding and erosion control practices.

MINERALS MANAGEMENT

In recent years energy minerals and other strategic minerals have become more costly and increasingly more important to the Nation's economy. As worldwide oil and gas supplies become short and demand remains high, the National Forest System lands will play a growing role in energy supply. The same holds true for strategic hard rock minerals, such as platinum and molybdenum. Exploration and development activities will and are placing substantially increased workloads on Forest managers to permit needed mineral development, while assuring protection of the renewable resource production capability of Forest lands. More than 95 percent of all oil exploration on the National Forests through 1975 was in relatively small areas on easy-to-develop sites. As it becomes more cost-effective for private industry to explore and produce minerals in rough terrain, the Forest Service is becoming increasingly involved in minerals management activities.

Operating Plans

This Nation's energy shortage, plus the control of supply by developing countries, has contributed to drastically increased mining and leasing activities on National Forest System lands. The minerals workload has increased proportionately, resulting in a backlog of 6,000 unprocessed lease requests and operating plans at the beginning of fiscal year 1980 (appendix tables B 9.3 and B 9.4, pages 115 and 116). In an effort to reduce this backlog, the Forest Service reemphasized the importance of issuing leases in 1980, and thus increased lease output by 40 percent. Despite this effort 1,300 additional unprocessed requests and plans were added to the original 6,000 backlog making a total 7,300 at the end of fiscal year 1980. The current workload is resulting in pressure to authorize activities without thorough review.

During the year, 21,508 operating plans were completed or administered during 1980, 35 percent more than the funded program (15,865) called for (appendix table B 9.1, page 114). These plans cover mining activities from initial exploration through site reclamation for hard rock, energy, and common variety minerals, and are designed to protect soil, water,

and other values. Energy minerals production on National Forest System lands for the fiscal year is estimated at 12.2 million barrels of oil, 220 billion cubic feet of gas, and 6.5 million tons of coal (appendix table B 9.2, page 114).

Four-Year Program Evaluation, 1977-1980

Situation. The 1975 RPA Program anticipated increasing mineral activities and expressed the projected workload in acres. Workload is now measured by the number of operating plans being administered.

Regulations implemented in 1974 require approved operating plans for significant mineral production and development activities on National Forest lands. Plans are designed to assure protection of the land surface and future production of renewable natural resources.

Operating plans in effect increased 70 percent from 12,640 in 1977 to 21,508 by 1980, an annual average increase of 17.5 percent, or 2,956 plans. From 1979 to 1980, the backlog of pending plans increased 29 percent from 6,000 to 7,300, while new plans implemented increased from 1,057 to 6,248 (table B 9.3, page 115).

Funds appropriated to administer the minerals program increased 40 percent, from \$9.08 million in 1977 to \$13.457 million in 1980--an annual average of 14 percent, or \$1.46 million. Program administration costs per plan decreased from \$718 per plan in 1977 to \$617 per plan in 1980 (table B 9.3, page 115).

Evaluation. Unstable foreign supplies of minerals and petroleum, new technology, domestic price deregulation, and increased selling values have all combined to encourage increased domestic exploration and development of minerals and petroleum supplies. Mineral exploration on National Forest lands has increased many fold, resulting in submission of increasing numbers of operating plans.

The capability of the Forest Service to review and approve submitted operating plans in a timely manner has increased significantly, but not sufficiently to keep pace with the workload. The increasing backlog of pending operating plans (22 percent in 1980) is an indication of the problem. Pending plans represent delayed exploration or development activities.

The minerals program is based on industry-generated submittals, making accurate budget proposals difficult. Conditions generating increases in the minerals program are not expected to change in the foreseeable future, indicating a need to increase Agency capability to respond to the needs of industry and to provide necessary resource protection.

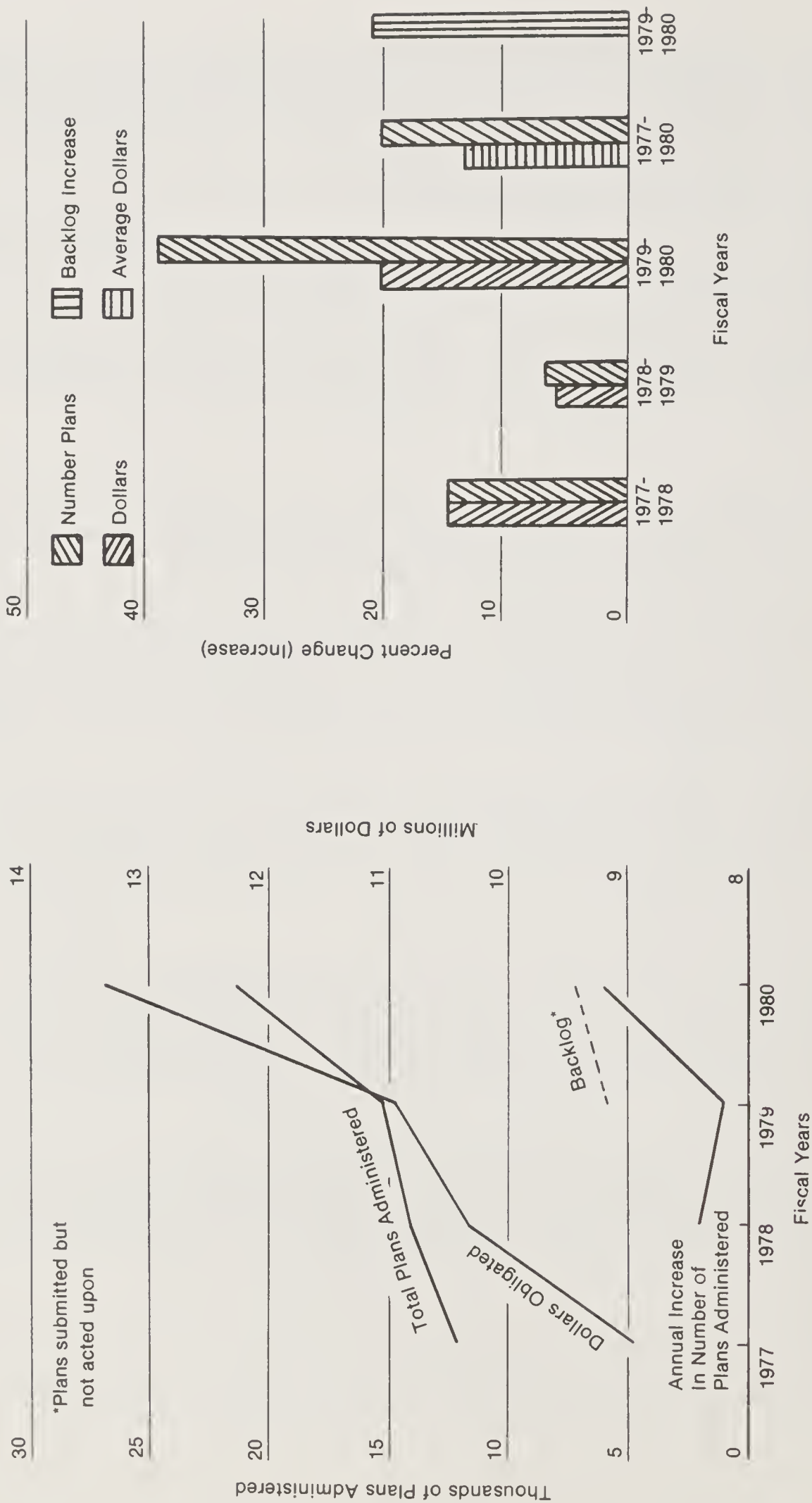


Figure 6.--Comparison of number of minerals operating plans administered and funding (left) and percentage changes in the number of plans and costs by years (right)--1977-1980

FIRE

Fire Management policy has been clarified and explains that there are two types of fires on National Forest System land--(1) wildfire and (2) prescribed fire. Every wildfire requires an appropriate suppression response. Every prescribed fire is to be conducted in compliance with an approved plan. The use of unplanned ignitions for prescribed fires must be approved by the Regional Forester. Wildfire is not to be used as a management technique.

Fire Management policy on National Forest System lands provides well-planned and executed fire protection and fire use programs that are cost efficient and responsive to land and resource management objectives and supportive of RPA goals, objectives and outputs.

Fire Control

Ten thousand five hundred fires burned approximately 200,000 acres of National Forest land. Based on 5-year averages, this is 15 percent below normal for acreages, and 25 percent below normal for number of fires. A generally hot, moist summer resulted in a fire season of below average severity throughout most of the United States. There were some areas, however, that had more severe seasons. The Northeast section of the United States experienced an earlier than normal and more severe fire season than 1979. Dry autumn weather resulted in a severe fire season in the South Central United States and California.

Fire Management

National Forest System fire management policy requires specific analysis to support fire and program planning and implementation and assure the program efficiently meets resource direction. Analysis has resulted in data to provide the basis for two reports: "Fire Management Budget Study" and "Fire Management Budget Analysis 1980." An analysis system has been developed and implemented. The fire management analysis uses an economic efficiency criterion with simultaneous consideration of budgeted protection, expected suppression costs, and expected net value change in resources to determine fire organization mix and budget level. An efficient program is specified by the lowest sum of cost plus net value change.

Fire Prevention

Reduction of fire hazard through removal of excessive and unnecessary slash is an ongoing program. Fuel reduction was accomplished on 761,590 acres in fiscal year 1980, exceeding the funded target of 442,000 acres by 72 percent (appendix B 10.1, page 117).

Two challenges of 1980 deserve special note. The Mount St. Helens eruption in western Washington was a challenge to the Forest Service. Fire managers were faced with the unique problem of keeping fire from moving out of the devastated area, and protecting the safety and health of

firefighters in the area of volcanic activity. The situation required developing a Comprehensive Action Plan and establishing a Command Center to direct and coordinate operations within the hazard zone.

The second challenge was the reimbursable fire control support provided to Canada to aid them in responding to an unusually severe fire season.

Dispatched to the Provinces were 184,000 pounds of equipment, and 56 people, including a Class I fire management team used directly on fires, a training team, and support technicians.

ROADS

Transportation is a primary element in the development, management, and protection of the National Forest System lands and resources. A well-planned road network is a key factor in responding to growing resource demands upon the National Forests. It is essential to minimize impacts of those demands on environmental quality while expanding resource uses and outputs.

Last year, 923 miles of road were constructed on National Forest System lands during the year. This amount exceeds the target figure of 780 miles. One hundred and twenty-five bridges were also constructed. The target of 10,250 miles of roads to be constructed by timber purchasers was not met, largely because many small businesses elected late in the year to have the Forest Service construct the roads. Timber purchasers did construct 8,021 miles of road and 64 bridges and returned an additional 1,541 miles to the Forest Service for construction under the purchaser option (appendix tables B 11.1 and B 11.2, pages 118 and 119).

LANDS

The Forest Service acquires and exchanges land primarily to consolidate the National Forest System lands and to improve the administration and management of both public and private lands. The exchange of isolated tracts of Forest Service land and the acquisition of available desirable private tracts results in substantial savings in administrative cost for both the private landowner and the Forest Service. Savings are obtained by reducing the 272,000 miles of property bordering about 3 million private landowners, reducing the number of property corners to be maintained, and by reducing the potential for additional occupancy trespasses. Consolidation of National Forest System lands through land exchange and acquisition program helps to improve the management of all resources.

In 1980 the funded target for the land exchange program was 76,850 acres or 30 percent of the RPA projection. Accomplishments were 75,828 acres, 1 percent less than the target. The Forest Service acquired an additional 65,063 acres of land through other authorities. Land and Water Conservation Funds were used to purchase 57,662 acres, and Weeks Act funds to

purchase 5,195 acres. Twenty landowners donated 2,206 acres to the Forest Service (appendix table B 12.2, page 200).

The 1980 target for landline location was 6,275 miles. Accomplishments totaled 6,228 miles, 47 miles or 1 percent short of the target (appendix table B 12.1, page 120).

STATE AND PRIVATE FORESTRY PROGRAM

Introduction

Through cooperative programs with State and local governments, forest industries and private landowners, the State and Private Forestry Program of the Forest Service helps to protect and manage over 630 million acres of non-Federal public and private forest land. Activities are administered by the seven Regional Foresters in the 15 Western States, Alaska, Hawaii, and the Pacific trusteeships, and by the two Area Directors in the 33 Eastern States, Puerto Rico, and the Virgin Islands (figure 7).

Fiscal year 1980 targets for State and Private Forestry programs were negotiated between State forestry organizations and the Forest Service, with original RPA figures as guides. For many activities, RPA estimates were adjusted to establish "funded targets." These target deliberations with States are part of the program budget planning process. The funded targets represent expected accomplishments through the combined funding from Federal and State governments. Overall, appropriated funding for fiscal year 1980 averaged 52 percent of the 1975 RPA recommended program for fiscal year 1980. Table 1, page 28, illustrates funded targets and original 1980 RPA estimates for some selected items. Additional detail is shown in appendix C.

Cooperative Programs

State and Private Forestry Programs are addressed in four broad areas:

1. Area Planning, Management Assistance, and Technology Implementation
2. Cooperative Forestry
3. Cooperative Fire Protection
4. Forest Pest Management

AREA PLANNING, MANAGEMENT ASSISTANCE, AND TECHNOLOGY IMPLEMENTATION

Included in this program is Forest Resource Planning; the Cooperative Watershed activities including Resource Conservation and Development (RC&D), Small Watershed Operations (P.L. 566), River Basin Surveys and Plans, and Flood Prevention Operations (P.L. 534); Organization Management Assistance (OMA); and Technology Implementation. Forest Resource Planning, Organization Management Assistance, and Technology Implementation are authorized by the Cooperative Forestry Assistance Act of 1978. The forestry portions of the other programs are administered jointly with the Soil Conservation Service which has overall leadership responsibility.

Forest Resource Planning

The primary emphasis in this program is to improve the forest resources planning capability of the State Foresters through preparation of

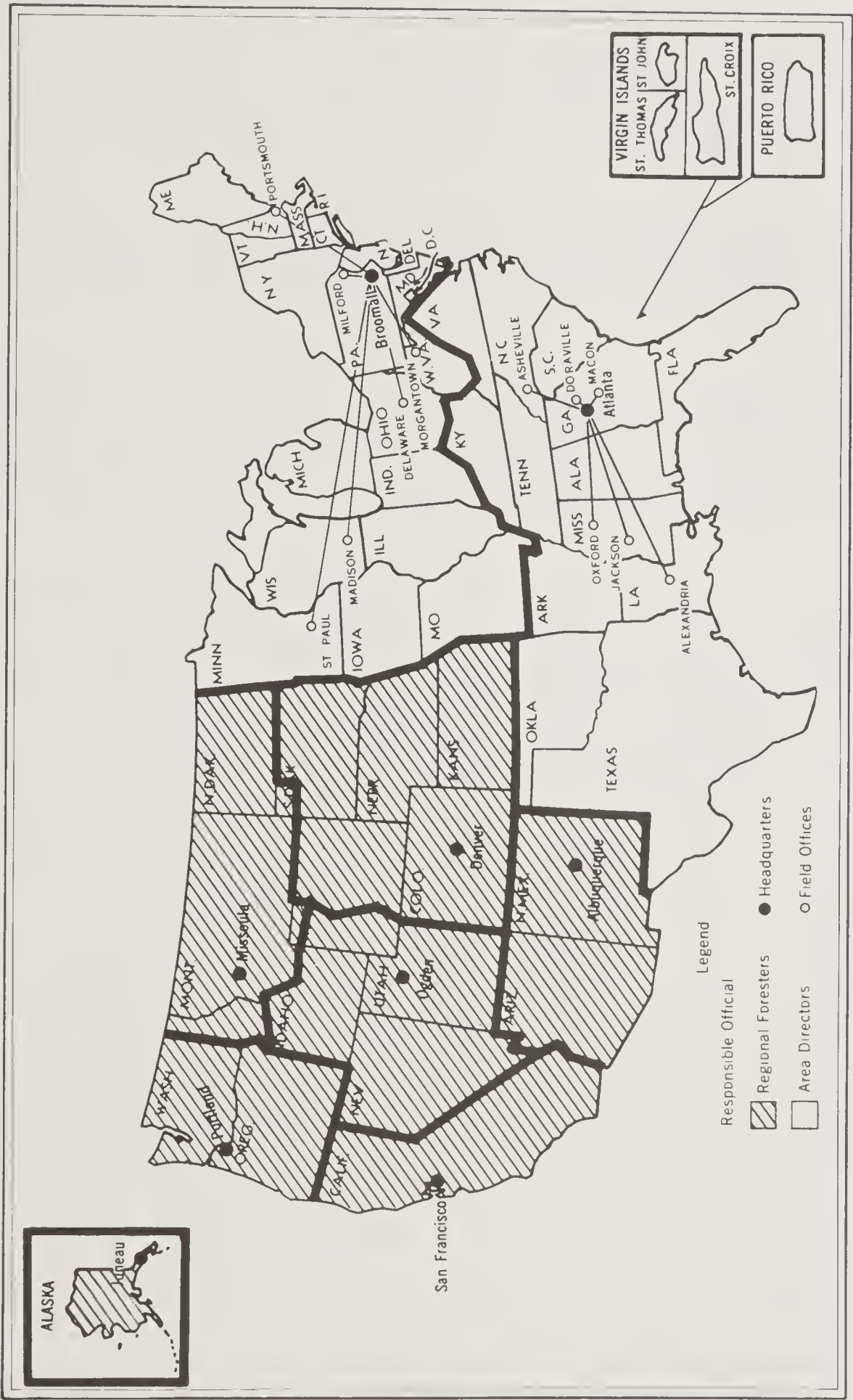


Figure 7.--State and Private Forestry Regions (West) and Areas (East) of the Forest Service

Table 1.--Funded targets and RPA estimates for selected activities

Item	Unit of measure	RPA estimates (average)	FY 1980 funded target	FY 1980 accomplishments
Forest Land Management Plans	No. plans	77,350	36,800	50,900
Cooperative Water Related Plans	No. plans	220	175	175
Reforestation (includes forestry incentives)	Thousand acres	679.5	413.1	465.6
Timber Stand Improvement (includes forestry incentives)	Thousand acres	400.0	293.6	231.7
Improved Utilization	Million cu. ft.	377.5	170.9	171.8
Fire Protection	Million acres	--	309	784
Fires per million Acres Protected	No. fires	212	400	129
Surveys--Insect and Disease	Million acres	840	615	657
Suppression--Insect and Disease	Million acres	3.3	3.7	2.5
Organization Management Assistance to States	No. assists	197	177	192

Statewide forest resource plans. With Federal assistance totaling \$550,000 in fiscal year 1980, most States have employed planners to guide their planning efforts. To date, 47 States have begun to develop comprehensive Forest Resource Plans. Completion for all 50 States is targeted for 1983. The information will be used both in State planning activities and the 1985 RPA Update.

Program value is measured by the integration of sound forestry and land management principles in State and local planning efforts, and more effective allocation of available resources that results in less resource damage, increased resource outputs, and improved quality of life.

Resource Conservation and Development (RC&D)

The overall objective is to improve local economic well-being through technical forestry assistance. Assistance is provided through funding to State forestry agencies which in turn support local RC&D program objectives. The objectives include better utilization of natural resources, enhancement of economic development, and protection of rural life styles.

Cooperative Watershed Activities

Though overall leadership is assigned to the Soil Conservation Service, the Forest Service has responsibility for the planning and installation of forestry measures in Small Watershed (P.L. 566) and Flood Prevention (P.L. 534) projects and for the forestry aspects of River Basin studies and Resource Conservation and Development projects. During fiscal year 1980, \$3.2 million was allotted to the Forest Service to plan and accomplish identified forestry measures cooperatively with State and local sponsors. In 1980, technical assistance in forestry focused on 130 authorized small watershed projects, while planning efforts concentrated on 138 small watersheds and 37 river basins. Also \$3.9 million was allocated to maintain and enhance the natural resources on eight authorized flood prevention projects. Flood Prevention Program results included erosion control on 513 acres, implementation of proper timber harvesting methods on 50,000 acres (avoiding resource damage and providing flood retention capability as a result), and bringing 9,500 acres of land into productive forests through reforestation. Examples of long-term results on the Yazoo-Little Tallahatchie projects are: For every 2 inches of topsoil retained, timber outputs increased as much as 11 cords per acre in the South; and sedimentation decreased by about 1 ton per acre treated, or about 50,513 tons in 1980. Details of the several projects are in appendix C 2 and C 3, pages 123 through 128.

Organization Management Assistance

To enhance the efficiency of State forestry organizations, \$813,000 was allocated in fiscal year 1980, and assistance provided 192 times. Key activities included human relations training, organizational assessment, workload analysis, and assistance to States in grant administration. These efforts have increased management effectiveness as shown by the following examples: One State improved nursery seedling sales by about 81 percent with a \$12,000 annual decrease in labor costs; in one district

of another State overall program outputs (State operations) increased by an average of 13 percent annually; and a third State decreased their days lost to accidents by 25 percent and their accident occurrence by 18 percent in fiscal years 1978-79.

Technology Implementation

Major progress has been made in 1980 in meeting Service-wide technology implementation goals. Examples are: (1) three Regions and Areas now have staff personnel with specific technology implementation process assignments, and the Northeastern Station has a full-time technology implementation specialist; (2) a slide-tape technology implementation planning guide and lesson plan have been developed; (3) several technology implementation plans have been developed including the Truss-Frame Light Construction Project, the Colorado State Technology Transfer Project, and the Timber Inventory and Management Planning Information System (TIMPIS) project; and (4) tapes containing 25,000 bibliographic records have been supplied to the Bibliographic Records Service as a start of a national and international forestry technical information data base.

The USDA Technology Implementation Committee was formally established. The Committee, chaired by the Forest Service, was authorized by the Administrators of Agricultural Stabilization and Conservation Service, Farmers Home Administration, Forest Service, Soil Conservation Service, and Science and Education Administration. Committee activities include analysis and implementation of the Technology Innovation Act of 1980, baseline evaluation of USDA technology implementation efforts in forest-related technologies, and development of interagency technology implementation thrusts.

COOPERATIVE FORESTRY

These programs, authorized by the Cooperative Forestry Assistance Act of 1978, assist State forestry agencies for improved wood utilization, reforestation, timber stand improvement, multi-resource management, and urban forestry assistance.

Rural Forestry Assistance (RFA)

This program includes technical assistance for: forest management to nonindustrial private forest landowners; improved efficiency of wood utilization to harvestors and processors; and production and genetic improvement of tree seedlings for forestation. Accomplishments of the program reflect advice and assistance provided to recipients by professional State forestry personnel.

Funding for RFA in fiscal year 1980 totaled \$13.4 million, about 45 percent of the recommended amount in the 1975 RPA Program. Accomplishments ranged from 10 to 77 percent of the low RPA Recommended Program. Accomplishments exceeded funded targets for all projects but timber stand improvement (appendix tables C 4.1, 4.2, 4.3 and 4.4, pages 129 through 132).

The 51,000 forest land management plans involving 4.3 million acres greatly exceeded expectations. The increase occurred in Alaska where expanded assistance to native corporations resulted in a seven-fold increase in accomplishments and in the East where State service foresters exceeded targets by over 40 percent. The funded target for wildlife and fish assistance was also significantly exceeded reflecting increased interest by landowners and State forestry agencies in improving wildlife habitat. The combined accomplishments of the RFA program and the Forestry Incentives (FIP) and Agricultural Conservation (ACP) Programs resulted in 466,000 acres of reforestation and 232,000 acres of timber stand improvement. Emphasis on reforestation has been increased, especially in the South where a significant net reduction in softwood acreage has been occurring in recent years. The shortfall from targeted timber stand improvement is due primarily to severe constraints on the use of herbicides for forestry purposes. Accomplishments by State nurseries in production of 692 million tree seedlings is consistent with the increased emphasis on reforestation.

Technical assistance for improved harvesting and processing increased wood utilization efficiency by 172 million cubic feet. Of this total, about 27 million cubic feet resulted from wood for energy activities. This includes formerly unused material recovered from the harvest site and from primary and secondary processing operations that is subsequently directed to domestic or industrial fuelwood products.

Urban Forestry Assistance (UFA)

The UFA program authorizes Federal assistance through State forestry agencies to encourage the judicious management of trees, forests, and associated natural resources in and near urban areas.

The Federal/State UFA program is targeted toward planners, developers, builders, landscape architects, city foresters, citizen groups, tree service companies, forestry consultants, homeowners and others.

Examples of activities include: (1) assistance in comprehensive urban forest planning at the urban/rural fringe to reduce loss of forest land to urban sprawl, reduce soil erosion, and protect the forest resource during urban development and construction; (2) urban wood waste utilization advice to insure that such wastes are available for conventional wood products or as a supplemental energy source; (3) advice on the proper placement and use of trees in passive energy conservation measures; (4) assistance to cities relative to the proper selection, placement, care and management of trees in order to enhance community stability; (5) multiple use management advice to owners of the urban forest to enhance recreational opportunities, watershed management, wildlife habitats and the general esthetics of urban areas.

In this third year of the UFA Program, all 50 States plus Puerto Rico, the Virgin Islands, Guam, and the District of Columbia participated.

Forty additional State urban forestry personnel were hired or reassigned to urban forestry duties, bringing the total person-years of technical

assistance to 190. Accomplishments are measured by number of urban areas assisted each year. Inconsistencies between target, and accomplishment (appendix table C 4.1, page 129) are largely due to redefinition of the accomplishment category.

Forestry Incentives Program (FIP)

This program provides cost-sharing and technical assistance to nonindustrial private forest landowners for reforestation and timber stand improvement practices. The objective is to increase future yields of forest products from lands currently producing below their potential. The Forestry Incentives Program (FIP) is administered jointly by the Forest Service and the Agricultural Stabilization and Conservation Service (ASCS) and is carried out through State forestry agencies and the State and County offices of ASCS.

Fiscal year 1980 was the third consecutive record breaking year for program accomplishments. The 342,000-acre total of reforestation and timber stand improvement (appendix table C 4.1) compares with 329,000 acres in 1979 and 327,000 acres in 1978.

The demand for FIP cost-share funds far exceeds the supply, many requests by landowners cannot be approved because of lack of funds. A four-fold increase in this unmet demand has occurred during the last 3 years. Because of this, some States have stopped taking requests. The amount earned by landowners who completed practices in fiscal year 1980 exceeded the \$13.5 million available from the appropriation for costsharing by \$3.9 million.

Agricultural Conservation Program (ACP)

The forestry portion of the ACP offers incentives to landowners to improve resource conservation through reforestation and timber stand improvement practices. It is jointly administered by the Forest Service and ASCS. Technical assistance to implement the cost-share practices is provided by State forestry agencies.

Of the 697,000 acres of reforestation and timber stand improvement accomplished in fiscal year 1980 (appendix tables C 4.1, 4.3, and 4.4), 110,000 is credited to ACP (49,000 acres of reforestation and, 61,000 acres of timber stand improvement).

The reemergence of wood as an energy source has increased emphasis on ACP forestry practices. An example is the New England Pilot Firewood Project initiated in 1979 in three New England States. It has been expanded to six States, attesting to its popularity and usefulness to woodland owners, firewood producers, and consumers. The project provides professional assistance to reduce improper cutting on nonindustrial private lands and creates an opportunity for needed silvicultural work in a region with large areas of overstocked hardwood stands. To date, 1,300 landowners have thinned 20,000 acres of timber yielding estimated 126,000 cords of firewood with an energy displacement equivalence of 315,000 barrels of fuel oil. Analysis shows that the project is

yielding an overall benefit/cost ratio of 1.6:1. Avenues are now being explored for possible project expansion to other States.

Four-Year Program Evaluation, 1977-1980

Situation. The 1975 RPA program proposed increased emphasis on timber production from nonindustrial private and State and local public lands. This emphasis would have increased wood output from these ownerships from between 7.5 to 7.7 billion cubic feet in 1977 to between 8.4 to 9.1 billion cubic feet in 1980. One of the primary sources of this increased wood output involved tree planting and timber stand improvement (TSI) activities.

Table 2 summarizes the RPA goals and actual accomplishments in these two categories. The RPA goal for 1977 is artificially low because it was based on the proposed President's budget for that year. RPA goals for 1978 and 1979 are somewhat higher to compensate, in part, for the low goals established for 1977. This makes year-by-year comparisons difficult, but a comparison of RPA goals and actual accomplishments for the entire period should be valid.

Table 2.--RPA projected accomplishment and actual program-related accomplishments in planting and TSI--1977-1980 (acres in thousands)

Year	Forestation		TSI		Total Acres	
	Actual	RPA	Actual	RPA	Actual	RPA
1977	210	92	152	65	362	157
1978	326	696	275	473	601	1169
1979	371	720	239	498	610	1218
1980	466	652	233	384	699	1036
Total	1,373	2,160	899	1,420	2,272	3,580
% Actual/RPA	64%		63%		63%	

Only about two-thirds of the needed planting and TSI was actually accomplished over the 4-year period. While not matching the RPA goals, significant increases, especially in forestation, have been achieved over the period.

Planting and TSI work under the Forestry Incentives Program provides a large part of the total S&PF accomplishment. This is shown in table 3.

Table 3.--FIP accomplishments and appropriations--1977-1980 (acres in thousands)

	1977	1978	1979	1980
Reforestation	153	169	212	219
TSI	155	154	117	123
Total	308	323	329	342
Appropriation	\$ 15MM	\$ 15MM	\$ 15MM	\$ 15MM

Note that FIP accomplished 11 percent more acres in 1980 than in 1977 with the same dollars even in the face of inflation.

Evaluation. A recent study by the National Forest Products Association indicates that about 1,000 cubic feet of annual incremental wood yield results from each 13 acres of forestation and timber stand improvement on nonindustrial private forest land. ^{1/} At this rate the average annual S&PF accomplishment (568,000 acres) over the past 4 years produces an annual incremental yield of 44 million cubic feet. The FIP contribution to this was 325,000 acres treated producing a 25 million cubic feet annual incremental yield. These attainments are well below the potential of the cooperative forestry programs and are inadequately responsive to the need for substantially increased wood production from private forests. Many nonindustrial private landowners are unable or unwilling to make long-term investments in forestry practices on their lands without assistance. The demand for cost-sharing through the Forestry Incentives Program exemplifies that with assistance landowners will institute resource management.

Due to failure to meet the 1975 RPA goals for investments in forestation and timber stand improvement, together with supporting technical assistance to landowners, the goal for increasing potential annual yield on nonindustrial private land was not met. If continued, these shortfalls in investment will make it extremely difficult to meet the long-term 1975 RPA target of an increase in yield from these lands to between 14.3 and 17.4 billion cubic feet per year by 2020.

COOPERATIVE FIRE PROTECTION

Through the Rural Fire Prevention and Control Program, States and other cooperators are provided financial and technical assistance to prevent losses of timber and other resources on 1.5 billion acres of non-Federal rural lands.

^{1/} National Forest Products Association, 1980, Forest Industries Council Forest Productivity Report, Washington, D.C. 56 p.

In fiscal year 1980, funded targets were to protect 309 million acres, and hold the number of human-caused fires to fewer than 124,000. Only 101,000 human-caused fires occurred, and 784 million acres were protected (appendix table C 5.1, page 133). Two factors were involved in exceeding the goals this year:

1. With the exception of parts of the Southeast, national weather conditions were favorable. No long periods of drought occurred, and rains fell at timely periods during the year.

2. More significantly, the products of past funding are beginning to pay dividends. People are better trained, equipment is more sophisticated, and organizations are more efficient.

The Rural Fire Prevention and Control Program also provides the basis for the Forest Service, in cooperation with State foresters and the Advertising Council, to carry out the Smokey Bear Cooperative Forest Fire Prevention Campaign. Through this highly successful campaign, school children are made aware of the danger from forest fires and become Smokey's partners in preventing fires. In 1980, cooperating members of the media donated over \$52 million worth of time and space for Smokey's message.

Through the Rural Fire Prevention and Control Program, the Forest Service works with the General Services Administration to make Federal Excess Property available to State Foresters and other cooperators for fire protection activities. During 1980, 1,400 pieces of equipment valued at \$2.4 million were loaned to the States to extend their fire protection programs.

The Rural Community Fire Protection program helped provide protection to over 3,500 rural communities with populations of less than 10,000 people.

FOREST PEST MANAGEMENT

The Forest Pest Management (FPM) program for fiscal year 1980 emphasized prevention, detection, suppression, and special projects to reduce forest resource losses from insects and diseases. These activities were accomplished directly on Federal lands and in cooperation with State Foresters on State and private lands. Cooperation with the States included both technical and financial assistance.

Survey and Assistance

Detection and evaluation surveys were made on 657 million acres of forested lands on all ownerships in fiscal year 1980; the funded target was 615 million acres (table 1).

Emphasis was given to inclusion of forest insect and disease management strategies in the land management planning process and resource management plans in fiscal year 1980. Nationwide this was done for 263 plans.

Prevention and Suppression

Operational suppression projects were conducted against the mountain pine beetle and dwarf mistletoe in the West, the southern pine beetle in the Southeast, and the spruce budworm and gypsy moth in the Northeast. A total of 2.5 million acres of timber received treatment.

A demonstration project using Bacillus thuringiensis (B.t.) was conducted jointly with the Maine Bureau of Forestry. The B.t. was applied over a large area (200,000 acres) and effectively protected foliage from the spruce budworm. The population was reduced by 88 percent and tree mortality was reduced by about 80 percent.

Bark beetle outbreak trends were static to upward in 1980. The mountain pine beetle was static in the West, but the southern pine beetle continues its cyclic upward trend in the Southeast. Salvage and removal of infested trees have helped to reduce beetle population buildups and spread. In the Southeast, salvage of 206 million cubic feet of timber was accomplished. In the West, 34.6 million board feet of timber was salvaged from beetle and dwarf mistletoe infested areas.

The continuance of gypsy moth infestations within the generally infested area of the Northeast has focused public attention on efforts to suppress populations and regulate spread. In 1980, defoliation was detected on 5,100,000 acres; more than double the acreage reported for any previous year and an eight-fold increase over 1979. The greatest increases in defoliation were in New York, Massachusetts, Pennsylvania, Connecticut, New Jersey, Maine, and New Hampshire.

The Forest Service conducted cooperative suppression projects for the gypsy moth in the States of New Jersey, New York, and Pennsylvania, treating 98,273 acres. Chemical insecticides provided 90 percent foliage protection and biological insecticides protected more than 70 percent of the foliage in areas treated.

Special Projects

A total of 45 special projects, including loss assessment, pilot control, and demonstration, were initiated or continued to evaluate new survey and control techniques and materials and to assess forest resource losses from insects and diseases. Integrated pest management strategies are being evaluated for control of the spruce budworm and gypsy moth in the Northeast; mountain pine beetle, western spruce budworm, dwarf mistletoe, and root rots in the West; southern pine beetle and seed orchard insects in the South; and Douglas-fir tussock moth and spruce budworm in the Southwest.

The use of pesticides is one component of integrated pest management. Pesticide use on National Forest System lands is detailed in Appendix E.

RESEARCH PROGRAM

Introduction

The Forest Service conducts the world's largest forestry research program through a network of eight Regional Forest Experiment Stations and the Forest Products Laboratory at Madison, Wisconsin. Field studies and laboratory research are conducted at 81 locations throughout the United States, Puerto Rico, and the Pacific Trust Islands, as well as in the outlying States of Hawaii and Alaska. Field experiments are also carried out on experimental forests, ranges and watersheds, and other lands under various forms of ownership and management. Figure 8 shows the boundaries of the Regional Stations, the location of Station headquarters and major laboratories, and the Forest Products Laboratory. Many of the headquarters and laboratory locations are on or near university or college campuses.

The research program includes more than 2,500 active studies conducted by approximately 970 scientists in 270 research units, which produce an average of 1,500 scientific publications annually (tables 1 and 2, pages 38 and 39). In 1980, the appropriation for research totaled \$109 million; of this amount, approximately 10 percent supported cooperative and other studies with colleges, universities, and other research organizations. In addition, the Forest Service received almost \$1 million for cooperative research funds. A complete breakdown of the research budget, including extramural research funds received and funds expended for cooperative research is shown in appendix D, tables D 1-D 3, pages 135 through 137).

Scope of the Research Program

Under authority of the Forest and Rangeland Renewable Resources Research Act of 1978 and the Forest and Rangeland Renewable Resources Planning Act of 1974, the Forest Service research program provides new knowledge, technology, and survey information for the management, utilization, and protection of renewable natural resources on Federal, State, and other public and private lands. The Forest Service Research program is closely coordinated with National Forest System, State and Private Forestry, and Human and Community Development Programs. Much of the research is national and international in scope and includes, but is not limited to, studies in seven broad areas: (a) timber management, (b) environmental research including range, wildlife, and fish habitat; watershed management; surface mineland rehabilitation; and recreation, (c) fire and atmospheric sciences, (d) forest insects and diseases, (e) renewable resources evaluation and economics, (f) forest products utilization and engineering, and (g) international forestry programs.

Research Planning and Coordination

Forest Service research program planning and coordination is accomplished within the framework of laws, congressional appropriations, Department regulations, and the interdepartmental coordinating devices at the national and regional levels. The Forest Service also cooperates with other agencies and organizations, public and private, in the interest of a coordinated and well-planned national and international forestry research program.

FOREST SERVICE - U. S. DEPARTMENT OF AGRICULTURE FOREST AND RANGE EXPERIMENT STATIONS, FOREST PRODUCTS LABORATORY

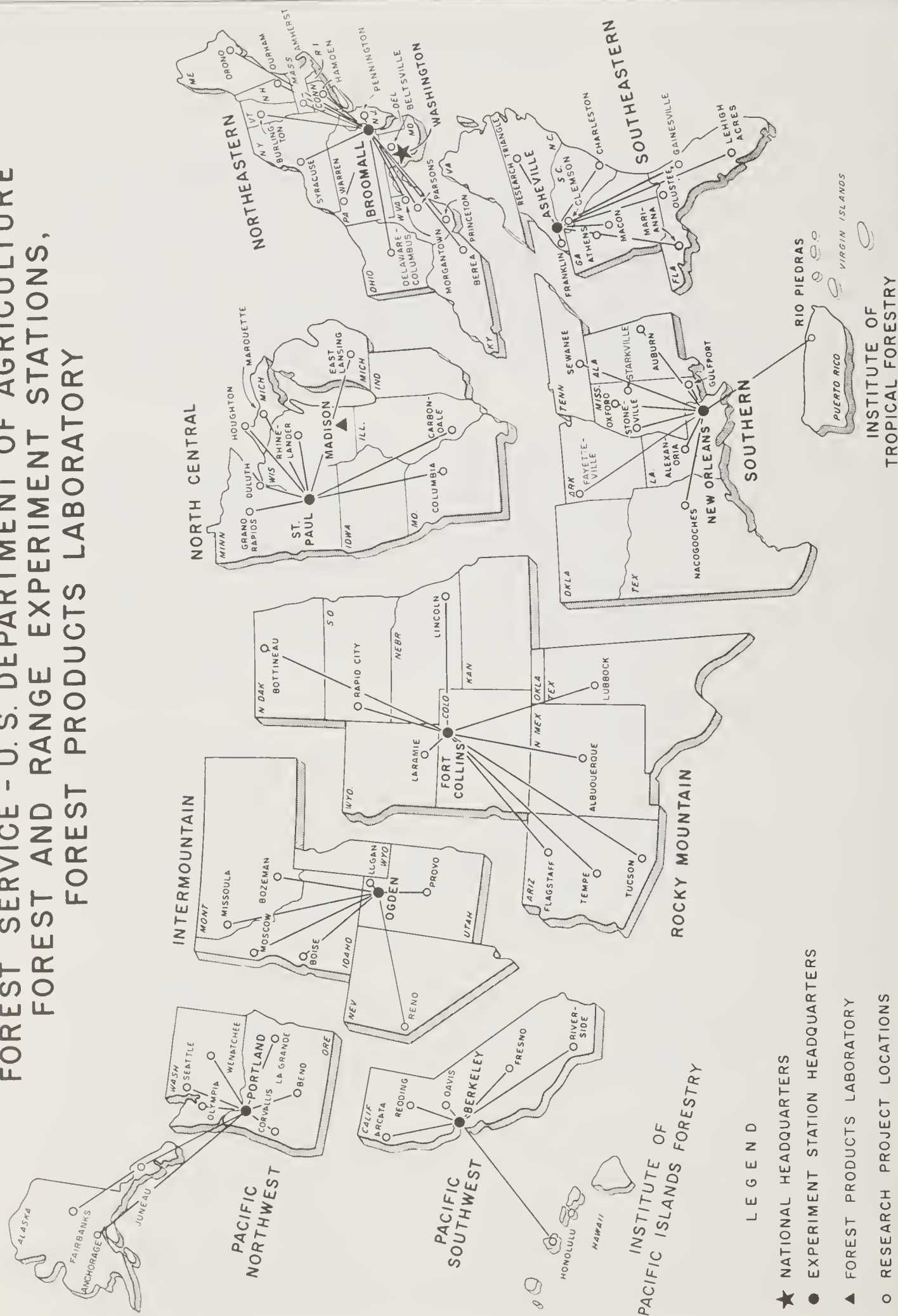


Figure 8.--Forest and Range Experiment Stations of the U.S. Department of Agriculture

Table 1.--Research manuscripts by major subject area published
in fiscal year 1980

Subject area	Number of publications
<u>Environmental Research</u>	
Watershed Management	119
Wildlife	176
Range	47
Fisheries Habitat	28
Forest Research	90
Urban Forestry	71
Disturbed Areas Rehabilitation	44
Total	575
<u>Insect and Disease Research</u>	
Insect Detection and Evaluation	60
Insect Biology	60
Insect Control and Management Strategies	102
Disease Detection and Evaluation	15
Disease Biology	52
Disease Control and Management	36
Air Pollution	8
Wood Products Organisms	24
Total	357
<u>Fire and Atmospheric Sciences Research</u>	
Fire Prevention, Hazard Reduction, and Prescribed Burning	25
Fire Management Methods and Systems	28
Forest Fire Science	22
Ecological Relations	41
Weather Modification and Weather Effects	24
Total	140
<u>Timber Management Research</u>	
Biological Relations	134
Silviculture	131
Management Mensuration	73
Genetics and Tree Improvement	60
Special Products	7
Total	405
<u>Economics and Marketing Research</u>	
Forest Resource Evaluation	99
Forest Economics	61
Supply, Demand, and Price Analysis	51
Total	211
<u>Products and Engineering Research</u>	
Improving Forest Engineering Systems	25
Wood Engineering	25
Wood Chemistry and Fiber Products	43
Utilization Potential and Processing of Wood	111
Total	204
Grand Total Published Manuscripts FY 1980	1,892

Table 2.--Summary of Research accomplishments--fiscal year 1980

Output	1979	1980
Publications, including those of a how-to-do-it nature and papers published in proceedings.	1,954	1,486
Published abstracts, book reviews, letters to the editor, unpublished theses, and papers presented but not published.	<u>1/</u>	1,277
General interest articles such as articles in "Forest Research in the West," informational brochures, Research Work Unit fact sheets, etc.	<u>1/</u>	130
Public patents awarded.	4	13
Technical papers prepared to represent official Forest Service position on policy or issues. (Unpublished)	599	179
Material prepared specifically for training. May include published or unpublished material, training films, etc.	111	150
Models or computer programs prepared and available for use. Each must be validated and include instructions.	134	119
Slide talks produced for distribution.	40	18
Films produced for distribution.	6	4
Technical workshops, symposia, field tours, or training sessions sponsored, hosted, or conducted.	691	982
Documented uses of information resulting from technical consultations.	1,857	1,904
Management prescription guidelines included in handbooks or supplements prepared for use by Federal or State agencies or by the private sector.	117	72
New or improved--trees, shrubs and insects, etc.--developed and available for release.	13	27
Types or prototypes of equipment developed and operational.	79	66

1/ Accomplishments were not compiled for these categories in 1979.

Forest Service research planning provides for a look ahead in terms of a projected program, as well as the translation of urgent problems into current research. The primary documentation of the project research is in accordance with the Forest and Rangeland Renewable Resources Planning Act (RPA) enacted in 1974. Its documentation illustrates costs and outputs which can be expected in the future under several alternative levels of management and research.

Forest Service involvement in research programs at the international level are coordinated through participation in international forestry programs such as the Man and the Biosphere Program (MAB), and through cooperation in programs with international agencies such as the Food and Agricultural Organization (FAO), Agency for International Development (AID), and other forestry agencies throughout the world.

SUMMARY OF RESEARCH ACCOMPLISHMENTS BY SUBJECT AREA

Each summary briefly describes a problem and the research accomplishment on that problem as well as how the new knowledge or technology is being applied. In many cases the lag time between technological development and adoption by the user is considerable. Therefore, some of the accomplishments cited here can be expected to have their major impact in the future. Appendix D displays the papers and publications issued in 1980.

Timber Management Research

Timber management research (1) develops scientific methods for culture of over 100 different tree species; (2) develops a scientific base for the management of forests for production of timber and related benefits and for modification and improvement of the environment; (3) provides forest managers with scientific data on the growth and yield of forests; (4) conducts research on intensive culture of important forest types to meet the growing needs for fiber and energy; (5) conducts forest genetics research on the production of new strains or hybrids that are superior in growth rate, wood quality, and resistance to insects, diseases, and other damaging factors, or have special value for environmental improvement; and (6) conducts research on timber-related forest products such as naval stores, maple sap, Christmas trees, and other income producing natural products.

Energy and Short Rotation Forest. In addition to the study of hybrid poplars in the Lake States and the Mississippi Delta, Forest Service researchers are testing fast-growing eucalyptus species for biomass energy farms in the warm tropical environments of southern Florida and Hawaii. Eucalyptus wood can be used for paper production, but use as a substitute for fuel oil in the boilers of citrus concentrating plants or electric generating plants seems more likely.

Scientists from the Southeastern Forest Experiment Station have shown that Eucalyptus grandis will produce about 3 cords per acre per year on land that is currently unproductive. Already, over 12,000 acres of commercial plantations have been established and as much as 3 million acres in the southern half of Florida may be suitable. Much of this land is now used as unimproved pasture, but the soil is so low in nutrients that about 30 acres are needed to support one cow.

Researchers at the Institute of Pacific Islands Forestry in Hawaii are developing guidelines for establishing, cultivating, and harvesting plantations of fast-growing eucalyptus. In studies funded by the U.S. Department of Energy, scientists have shown that closely spaced fertilized trees can grow 35 feet high in 3 years. Tests have also been conducted using a combination of eucalyptus wood chips and bagasse, a byproduct of sugar cane production, to fuel boilers. Wood chips from biomass energy farms may soon be used to supplement or replace oil and other expensive fossil fuel that must now be imported into Hawaii for producing electricity.

Fast-Growing Poplars for Fiber and Energy. Short rotation, intensive culture (SRIC) of fast growing poplars could help the forest products industry solve the problem of a dwindling land base. Wood produced from SRIC plantations is also suitable for conversion to energy and many useful chemicals. Research at the North Central Forest Experiment Station shows that yields three to four times that of natural forests can be obtained from hybrid poplars planted in cultivated, fertilized, and irrigated plantations. Such a system is also energy efficient with an energy output/input ratio for the harvested and chipped poplar of 9.6.

Research on genetic improvement of poplars at the North Central and Southern Forest Experiment Stations shows that both wood quality and yields can be enhanced. For example, such important properties as specific gravity, color, fiber length, and fiber-vessel ratio can be tailored for a specific mill and location by carefully selecting particular hybrids. Nine new selections for the Mississippi Delta show greatly increased growth compared with existing improved eastern cottonwood strains. These superior strains will be produced in several State forest nurseries for public distribution.

About 13 million acres, mostly marginal farm land, are available in the northern one-third of the Lake States for short rotation, intensive culture of hybrid poplars. Much additional land is suitable for planting fast-growing eastern cottonwood strains in the Mississippi Delta region.

Managers Need to Know How Much Timber They Grow. The capacity to forecast growth and yield of the timber stand is a prerequisite of effective planning and management of the forest resource. Yield tables and growth models developed by Forest Service Research are used by forest managers to formulate silvicultural prescriptions, to simulate the complex processes of growth over extended periods of time, and to analyze the financial aspects of management alternatives.

Growth models developed by the North Central Station are now available for both mature uneven-aged and second-growth even-aged stands of sugar

maple. Using these models, based on data from long-term permanent plot growth studies, forest managers in the Lake States can update inventories, compare management strategies, improve stand structure, and predict yields for managed stands of this valuable hardwood species.

Using Forest survey data, Southern Station mensurationists have devised a system of equations to estimate current yield and project basal area and volumes for merchantable natural stands of loblolly pine in the West Gulf area. Equations have also been developed to predict stand volumes for managed, natural longleaf pine for a variety of stand conditions, thinning regimes, and rotation lengths.

At the Rocky Mountain Station scientists have developed a computer program RMYLD, (Rocky Mountain Yield), to compute yield tables for even-aged and two-storied stands of Black Hills and southwestern ponderosa pine, Engelmann spruce, subalpine fir, and even-aged stands of lodgepole pine in the Rockies. RMYLD has the flexibility to compute yield tables where timber production is emphasized and also where forests are managed to improve wildlife habitat, recreation, scenic and water values. The program considers stand conditions and severity of dwarf mistletoe infestation with time and in response to partial cuttings. The land manager can now compute yield tables for the rotation of the stand for each management alternative prior to financial investment.

Managing and Protecting Tropical Forests. Tropical forests constitute about one-half of the world's forests but are rapidly being depleted. Because these ecosystems are critical to the existence of many millions of people and perhaps to the entire world, their management and protection is of utmost importance to scientists and resource managers. Scientists at the Southern Forest Experiment Station, in cooperation with the University of Florida, Cornell University, and the Tropical Science Center in Costa Rica, summarized available data concerning the role of tropical forests in the world carbon cycle. This included a synthesis of available information on the production and storage of organic matter in the tropics. Data were analyzed according to life zones, thus making the syntheses useful for extrapolation to all the world's tropics. This synthesis will provide a sound basis for predicting the role of the tropics in the world's carbon cycle and will assist tropical countries in their struggle to manage their vital resources.

How to Manage Ponderosa Pine. A recently published report "Silviculture of Ponderosa Pine in the Pacific Northwest: The State of Our Knowledge," will help practicing foresters manage 6.7 million acres of forest land in the ponderosa pine type in the Pacific Northwest.

Research results and observation over the past 40 years covering stand regeneration to final harvest are presented. A policy of gradual removal of mature trees by prudent logging to maintain existing reproduction is emphasized. Estimated yields of the next crop of trees are presented. Pests likely to be encountered in managing these new stands are also discussed. Over 100 references are cited that deal with managing the species.

Classifying Vegetation in Alaska. In the past, resource managers in Alaska lacked a detailed vegetation classification system which hindered long-range planning and development of suitable land management strategies. Now "A Preliminary Classification System for Vegetation in Alaska" has been prepared by scientists at the Pacific Northwest Station's Institute of Northern Forestry in Fairbanks, Alaska.

The 4-year effort, assisted by people interested in Alaska's vegetation, has resulted in a publication that is widely used by Federal and State agencies involved in inventory and mapping of vegetation in the State. The classification system has five levels of resolution, ranging from very broad formations to discrete plant communities. There are four terrestrial vegetation formations: forest, tundra, shrubland, and herbaceous, and one for aquatic vegetation. At the finest level of resolution there are 415 plant communities included in the preliminary classification. This classification system will be revised at frequent intervals as more is learned about the vegetation in the Nation's largest State.

Trees are Water Too. The Black Hills--an isolated mountain area that provides much of the surface water and ground water recharge to the surrounding dry Great Plains in South Dakota and Wyoming--is heavily forested with ponderosa pine. Current water yields barely meet needs, and development of nearby coal fields will cause serious user conflicts.

Scientists of the Rocky Mountain Forest and Range Experiment Station believe they have found a way to reduce these conflicts. Thinning dense pine stands on the Sturgis Experimental Watershed increased water yields nearly a third while water quality remained excellent. As an added benefit, tree growth improved greatly. Since almost one-third of the Black Hills National Forest--some 1.2 million acres--could be thinned to increase water yield, the potential bonus water could exceed 50,000 acre-feet per year, enough to meet the water needs of a city of 70,000. These increases have remained relatively constant over the 8 years since experimental thinning, and show no evidence of decline.

Forest Environment Research

This area of research includes studies relating to range, wildlife and fish habitat; watershed management, wildland recreation and surface mineland rehabilitation.

Return of Salmon to the South Fork. After an absence of nearly 20 years, salmon and steelhead are returning to the South Fork of the Salmon River in central Idaho. Results of research conducted by the Intermountain Station have been used to develop a watershed improvement and management program that supports the habitat so vital to the aquatic life of the river.

Logging and road construction activities during the 1950's and early 1960's, coupled with heavy rains, triggered extensive runoff. Tons of sand were dumped into the river and pools used by adult salmon became filled with sediment. Spawning areas were destroyed. In 1966, after a moratorium was imposed on timber harvesting in the South Fork drainage, Intermountain

Station researchers and National Forest managers began a special rehabilitation effort. Now, 16 years of records show that there has been dramatic recovery. The fishery now has a chance to rebuild itself.

These research results have been used in the development of a new land use plan for the South Fork of the Salmon River. The plan provides for moderate level timber harvests designed to prevent erosion and sedimentation.

Discover a New Way to Locate Grouse Broods. Wildlife biologists have a new method to help locate ruffed grouse broods more efficiently and with less risk to grouse chicks. Biologists need to find grouse in order to assess habitat quality and devise forest management practices to improve it, and in order to manage the populations. Locating grouse broods is important because the quality of their habitat may be the key to grouse production, but the broods have been particularly difficult to find.

Grouse hens with broods now can be attracted to tape-recorded calls of a "lost" chick. Hens respond throughout the brood-rearing period, making the recorded call useful for locating and capturing the grouse if the latter is needed for transplanting purposes.

Scientists at the Northeastern Station who developed the new method use it to determine whether or not grouse broods use various kinds of habitat and which kinds are best, and to capture and transplant birds.

Voice Printing Bald Eagles. Information on survival rates, nesting territory, and possible changes in nest location in different years is vital to assessment of stability of Bald Eagle populations. Traditionally, birds have been captured, marked, and released, which involves risks of injuring the birds during capture and handling.

Scientists at the Pacific Southwest Station are now able to identify and locate or trace individual birds through their voice prints--sonagrams--that produce audio-spectrographs that can be compared visually, and accurately measured to determine duration, frequency, and amplitude of notes for a repertoire of calls.

Scientists have been able to characterize the voice patterns of pairs of Bald Eagles at nesting sites in northern California. The studies show that the unique voice patterns provide a means of repeated identification of individual birds through several breeding seasons. Voice printing eliminates the risks associated with capture.

Results of tests over two breeding seasons, indicate that an adult eagle's vocal response to human intruders near the nest site is the most suitable call for voice print comparisons. Thus it will not be necessary to record each bird's full repertoire before accurate identification is possible.

The voice printing technique will allow ornithologists and wildlife biologists to assess the breeding population and nesting habits more rapidly, at less expense, and with minimal disturbance of the Bald Eagles.

Describing The Land. The Northern Rocky Mountains are a patchwork of forest, shrubland, and grassland vegetation. Species composition and

productivity, and consequent potential values, differ greatly between and within these major vegetation types. To achieve multiple use planning and intensive resource management on these lands, forest managers are concerned with such questions as, "What are the productive capabilities of each vegetation type?" and "How will the land respond to various management activities?"

Intermountain Station researchers have provided some answers to these questions in a habitat-type classification system for the grasslands and shrublands of western Montana. The system is the result of an intensive reconnaissance study. More than 350 stands--289 in grasslands, 66 in shrublands--were sampled to develop the classification. The land manager can use the system to predict management opportunities and consequences of selected actions.

Putting Wildland Shrubs to Work. Many of the rangelands of the West have been drastically altered by human activities. Livestock grazing, recreational activities, and surface mining--stripping away vegetation or changing the mixture of plants--have lowered the productivity of these lands. And erosion and flooding can follow disturbances.

As researchers of the Intermountain Station determine methods to rehabilitate the western rangelands, they are seeking ways to improve the native shrubs and grasses. They are identifying natural genetic variations, and selecting and developing the best varieties for specific uses.

Studies of sagebrush have indicated that some varieties are much better for some uses than others. Some plants grow fast; others grow slowly. Using this kind of information, land managers plant one variety of sagebrush to enhance deer browse, but use another variety to heal highway scars.

Roundup of Range Management Information. The 1980 "Selected Bibliography on Southern Range Management" is the product of an innovative process for collaborative literature searches and compilations. Citations assembled by a Forest Service cooperator--Winrock International Livestock Research Training Center--comprised a computer-based bibliographic file. The file was then edited, corrected, updated, categorized, and indexed by a team of range scientists, editors, librarians, and technical information and computer specialists. Team members worked largely from their own offices, relying heavily on various communication means to integrate their efforts. The 1980 publication is quite similar in appearance to earlier issues in the series; however, the author index, the keyword index, and the computer-produced, camera-ready copy were derived from the computer-based file instead of employing manual procedures. A searchable data base was also established, since the records are now part of CORR (Communications of Renewable Resources), an information resource available through Bibliographic Retrieval Services, Inc. Now that the process is operational, it should find widespread application in other forestry and forestry-related fields.

Large Organic Debris Benefits Streams. Large organic debris in streams has been a concern of forest land managers in recent years. Researchers at the Pacific Northwest Station and Oregon State University have been

studying its effects in streams since 1975, and results indicate that the debris plays a beneficial role in the stream ecosystem. Large pieces of wood have always been an important component of forest streams. The biological and geomorphic systems seen in streams today developed as a response to centuries of introduction, movement, and decay of large organic debris.

This debris can act as an effective sediment trap, releasing material gradually as the wood decays or is abraded. The woody debris often forms a series of steps or falls in the channel profile, reducing the local stream gradient and lessening the erosive power of the water.

Large organic debris also provides benefits for the biological community. Fish use it for cover and protection, and some invertebrates use the wood itself for living space and as a food source. Needles and leaves are often trapped behind the debris and, after conditioning by micro-organisms, become palatable to stream insects.

Studies are continuing regarding the effect of large organic debris on channel stability, the movement of large pieces of wood in stream channels, and the role of the adjacent stand in stream debris loading. Forest land managers are using these findings in planning for management of streams and streamside zones.

Logging Increases Sediment But Not Flood Peaks. For years, much of the concern over possible adverse environmental effects of timber harvest has centered on presumed increases in peak flows and sedimentation. This year, important insights into those concerns were gained with publication of the results of an experiment conducted jointly with Pacific Southwest Forest and Range Experiment Station and the California Department of Forestry. The findings were the culmination of 14 years of monitoring in the Caspar Creek experimental watersheds on California's north coast. Roads were built after a 5-year calibration period. Four years later, about 65 percent of the 95-year-old second-growth forest was selectively cut and tractor-yarded. There was no detectable change in streamflow peaks following road construction but there was an 80 percent increase in sediment yield. Following logging, only peaks less than 12 cfs increased significantly--these flows carry about 3 percent of the sediment and contribute little to shaping channels. No broadening of flood peaks was found. There was, however, a 275 percent increase in sediment yield during the 5 years after the start of logging. During most years, the sediment yield from Caspar Creek watersheds increased little as the stream power increased. During the first year following road construction and during the first four post-logging years, quite a different regime prevailed. Substantial increases in sediment transport accompanied increases in stream power--the stream had become more stream power dependent.

Apparently, the principal effect of logging was to make eroded soil available for transport. These results strongly suggest that reducing erosion will reduce sediment from forested watersheds, and that possible increases in runoff are of little consequence.

Acid Rain in the Lake States. No, you can not actually feel acid in the rain as yet, but its effects are there nonetheless. The North Central Station, in conjunction with the National Atmospheric Deposition Program, has been monitoring acid rain (and snow) in lower Michigan and north central Minnesota since 1978. Because of certain weather patterns, most of the acid rain falling in the Lake States area comes from the eastern United States. During winter and early spring, when the soil is wet or snowcovered, weather systems from the eastern States circulate back toward the upper Midwest and deposit acid-laden rain or snow. This is when the lowest pH values occur in the region. Then, in late June, when the soil is drying and cultivation begins, the eastern air is met by dust-filled, more alkaline air from the Great Plains that tends to neutralize the acidity and raise the pH. Thus, the Lake States are a battleground for the two air masses. Eastern air almost always wins out in lower Michigan; Great Plains air almost always wins out in southwestern Minnesota. But large fluctuations occur in the northern part of the region. Studies of lakes in northern Minnesota show that those west of the Arrowhead (northern Minnesota) have not so far been adversely affected by acid rain. Other studies are aimed at finding out the effect of such rain on forest productivity.

Revegetating Acid Spoil Banks With Trees and Shrubs. Many acres of acid spoil banks from old mining operations need to be revegetated. The survival and growth of trees and shrubs on ten acid strip mine spoils in the bituminous region of Pennsylvania were evaluated by scientists at the Northeastern Station. After 11 years, gray birch and European white birch survived and Scotch pine and bristly locust performed well on spoils with a pH of 3.5 and higher. European alder from one source, sawtooth oak, black locust, autumn olive, and Japanese fleecflower grew well only on a few plots.

Results of greenhouse studies indicated that yellow-poplar seedlings grew better in spoils collected under existing stands of black locust than other tree species on mine spoils with a pH of 3.1 to 3.6. spoils from stands of ash, white pine, or yellow-poplar. The superior growth is attributed to higher levels of soil nitrogen in the black locust soils.

This information will help agencies responsible for revegetating, especially reforesting, old surface-mined areas that are acid or those covered predominantly with black locust. Approximately 240,000 acres of abandoned coal mined lands in Pennsylvania need reclamation. Thousands of acres of mined lands in central northern Appalachia have been vegetated primarily with black locust. Landowners and managers may want to convert these areas to yellow-poplar for wood products in the future by controlling direct competition from black locust and other established vegetation.

A New Look At Trends In The Camping Market. The popularity of camping and recreational vehicle travel continues to grow. According to a 1979 survey, camping now ranks third behind swimming and bicycling among outdoor recreation activities. By 1978, the number of inactive campers outnumbered active campers nationwide with persons less than 30 years of age showing the greatest tendency to become inactive. Growth of the industry slowed in the 1970's but franchised campgrounds provided an increased share of sites. A 14 percent decline in campground occupancy was noted in 1979

and appeared to be correlated with gasoline shortages. The 1980 season showed a partial recovery in occupancy rates in all sections of the Country except the North Central States.

Researchers at the Northeastern Station are beginning to look beyond numbers of visitors as the only measure of how well we are performing as recreational resource managers. Using a simple 2-3-minute report card, distributed to a randomly selected group of visitors throughout the camping season, a composite measure of camper satisfaction is generated from 14 elements of a campground visit. Each element is ranked from "A" (excellent) to "E" (poor). By converting letter "grades" to scores, a scale monitors the slightest change in the satisfaction of campers visiting a given campground or all campgrounds in a park system. Tested at public campgrounds in three States, the system is now in its fourth year of operation at all New Hampshire State Park campgrounds.

Computerizing the Backcountry. As the popularity of our Nation's wildland areas grows, recreationists are encountering one another with increasing frequency. In environments where solitude is critical, or where inadequate, use must be regulated, scientists at the River Recreation Research Project in St. Paul and research cooperators at Northwestern University have developed a computerized mathematical simulation model that describes the travel behavior of campers in the backcountry. The model also shows how campsite use is affected by varying daily entry point quotas. As a result, managers can experiment with different control strategies on the computer in order to pick the "best" one for actual use. Advantage of this approach is that congestion can be controlled while still allowing visitors free choice of travel routes and schedules once access to the area is gained. The model has been used in the Boundary Waters Canoe Area Wilderness in Minnesota and in the Quetico Provincial Park in Ontario. The approach can be applied in any wildland area (such as on trails, rivers, lakes, and designated wilderness areas) to regulate campsite use without tampering with peoples' on-site activities.

Forest Fire and Atmospheric Sciences Research

Develops knowledge to integrate forest and range fire control with rural community fire protection and ways to coordinate firefighting with local agencies. Develops methods to prevent both incendiary fires and fires resulting from human carelessness.

Conducts research on controlled fires as a substitute for herbicides and wildfire in the ecological process and management of smoke from prescribed fire. Develops guidelines for meeting air quality standards. Studies methods to balance cost with potential damages from fire in order to be most cost effective and efficient. Conducts research on the economic consequence of fires burning under a wide variety of conditions.

Fire in South Florida Forest and Ranges. Tremendous population growth in south Florida has greatly increased pressures on the use of that area's natural resources. Control of wildfires and the use of prescribed fires are management practices that will have a strong influence on the nature of the future vegetation resource. Currently, almost 10 percent of the land area in south Florida is burned each year--95,000 acres by wildfire

and 550,000 acres by prescribed fire. Changes in land use and attitudes of people have increased the risk of fire and have resulted in severe conflicts of ideas and fire management objectives. To make the right decisions about the future management of fire, resource managers must understand the role of fire in south Florida's ecosystems.

The Southeastern Station has contributed to this understanding in a recent report titled "Fire in South Florida Ecosystems." This in-depth report describes the changing environment of south Florida, then outlines the history of fire in the area. The report reviews the available literature and relates the responses of ten major natural vegetation types to changes in frequency and intensity of fire. The report also discusses the relationship between burning and the spread of three introduced species--melaleuca, Brazilian pepper, and Australian pine--that have become important components of the arborescent vegetation in many locations.

Goats Maintain Fuelbreaks. California has a special fire management problem--4 million acres of chaparral that is highly flammable when mature. One method used to reduce the size and number of disastrous wildfires in chaparral is the maintenance of a system of fuelbreaks. Fuelbreaks are wide strips of low-growing vegetation used to break up expanses of highly flammable vegetation and provide an area of relative safety from which firefighters can work.

The Chaparral R&D Program is investigating the use of goats for controlling regrowth of vegetation along fuelbreaks. Goats are less expensive and more environmentally acceptable than herbicides or mechanical maintenance methods. Although goats cannot effectively reduce mature chaparral stands, they can maintain brush in an immature stage after older brush has been cleared. The degree of browsing can be controlled by varying the herd size or by confining the goats within portable fences. When confined within a limited area, goats will browse young sprouts of all chaparral species. If given a choice, however, they display definite preferences for some species over others. The goats are especially fond of birchleaf mountain mahogany and scrub oak, but unfortunately, are not attracted to chamise or manzanita.

The use of goats as a biological method of brush control is still in an experimental stage in southern California's National Forests. Managers hope, however, that as problems with the method are ironed out, goat grazing along fuelbreaks will become profitable for both the herders and forests.

Effects of Fire in Western Vegetation. Accurate information is a tool that enables forest managers to make informed decisions. The Fire Effects Research and Development Program of the Intermountain Station has provided such information in four comprehensive reports concerning the best use of fire to achieve management objectives in four major vegetation types of the Western United States.

One of the reports summarizes knowledge about the effect of fire on vegetation in ponderosa pine communities. Data are presented in an ecological format along with sections on management implications and the

state-of-the-art knowledge on the use of fire to manage these communities. Title of the report is "The Effect of Fire on Vegetation in Ponderosa Pine Forests."

Guidelines for conducting prescribed burnbrush-grass and pinyon-juniper communities are presented in "The Role and Use of Fire in Sagebrush-Grass and Pinyon-Juniper Plant Communities." The guidelines are based on an extensive survey of the literature and practical field applications.

General guidelines are recommended in "The Role and Use of Fire in the Semidesert Grass-Shrub Type." Managers can use these to develop specific management procedures in the southern desert grasslands.

"Fire Ecology and Prescribed Burning in the Great Plains" contains basic ecological information, vegetative descriptions, and fire effects data for the shortgrass, mixed grass, and tallgrass prairies in the southern, central, and northern Great Plains. Prescription guides are provided for all major vegetation types where prescribed burning data have been collected.

These four publications are technology transfer tools. Using the information, resource managers can integrate fire into their land management plans.

How Much Fire Damage Is Fatal? Lightning strikes, smoke curls upward, and a fire sweeps through a stand of ponderosa pine in eastern Arizona. After the fire is out, foresters examine the scorched trees, deciding which ones are so badly damaged they should be salvaged for timber, and which are most likely to survive. If too many dying trees are left, a valuable resource is wasted. But if too many potential survivors are cut, future timber yield may be reduced, or seed trees that could regenerate the stand may be lost. While many factors influence recovery potential of fire-damaged ponderosa pines, the two most important appear to be season in which the damage occurred, and extent of damage to the tree crown. Differences in physiological condition and stage of growth make the trees more susceptible to fire damage during the growing season. Survival potential is further influenced by extent of cambium damage, tree vigor, competition, insects, and moisture stress.

Rocky Mountain Station scientists analyzed these factors and how they interact to come up with an improved set of guides foresters can use to improve their accuracy in marking only fatally damaged trees for salvage.

Historical Weather Data Help Fire Managers Plan for Future. Wildland fire management is complicated by uncertainty about weather conditions that can strongly influence fire behavior. To plan for future fire operations that will occur beyond the time limits of accurate weather forecasts, fire managers rely on historical weather records to gain insight about likely future conditions. But how can the manager digest the volume of historical data to develop an optimal management strategy?

Help has been provided by Rocky Mountain Station scientists who have developed two analysis aids for planning the use of prescribed fire from either natural or planned ignitions. The first aid synthesizes weather

data into fire planning statistics that show when burning conditions are most likely to be within specified safe limits. The second provides information about the occurrence of atmospheric conditions that favor good smoke dispersion during prescribed fires. With these aids, fire managers can answer questions such as:

- o How many days can be expected to meet prescribed weather conditions?
- o During what parts of the year are prescribed weather conditions most likely?
- o What is the chance of several favorable burning days occurring in succession?

These planning aids are available to Forest Service and other land management personnel as computer programs maintained at the USDA Fort Collins Computer Center.

New Model Predicts Spot Fire Distance. Spot fires sometimes occur beyond the advancing front of a main fire because of ignitions from flying sparks or embers. Fire spread by spotting is a chance event requiring the right combination of fuels, wind, and fuel moisture. When spotting does occur, it complicates the task of wildfire control and sometimes causes prescribed fires to escape their intended boundaries. The inability to predict spotting severity increases the danger to firefighting crews and increases the chance of failure in planned fire management activities.

A new model developed by scientists at the Intermountain Station (Northern Forest Fire Laboratory) can help fire managers answer some of their questions about spotting. The model predicts the maximum spot fire distance that can be expected from a burning tree or small group of trees. The predicted spotting distance depends on tree species and size, wind speed, and downwind terrain. The algorithm for estimating spotting distance can be solved using a graphic procedure or a programmable hand-held calculator. Although many questions remain unanswered, experience with this new model should help fire researchers and managers to better understand and cope with spot fires.

Forest Insect and Disease Research

Develops techniques to minimize forest insect- and pathogen-caused losses and other disturbances in forest, rural, and urban environments and to protect wood in storage and use. Provides technology to detect, measure, and predict the occurrence of diseases and insect pests and to determine their ecological and socio-economic impact. Studies biology, ecology, and behavior of insect and pathogen pests and associated beneficial organisms. Expands methods to control insect and disease pests of trees, forest, and wood products through protection, exclusion, suppression, or sanitation, using silvicultural treatments, biological organisms, genetic resistance, chemicals, or other means that are economically feasible and environmentally acceptable.

Identifying Yellows-Type Diseases in Forest Trees. Forest Service scientists at the Northeastern Station have been investigating the cause of yellows-type diseases in native forest trees for a number of years. Japanese scientists startled the scientific world in 1967 when they reported the discovery of a link between certain yellows diseases and mycoplasmas. Mycoplasmas are organisms intermediate in some respects between viruses and bacteria. Although mycoplasma-caused diseases of animals have been known since 1895, no one suspected that mycoplasmas could cause plant disease. This discovery spurred a great deal of new research worldwide, including an extensive series of cytological investigations by scientists at the Forestry Sciences Laboratory, at Delaware, Ohio, to determine the possible relationship between mycoplasmas and certain important forest tree diseases. This research resulted in the first scientific reports of mycoplasma-caused diseases of native forest trees.

Scientists have identified the presence of mycoplasmas in the phloem of elm phloem necrosis, walnut and pecan bunch diseases, and black locust affected with witches'-broom. These are yellows-type diseases characterized by an overall yellowing and dwarfing of the foliage, or by the development of witches'-brooms in the crowns of trees. Of the four diseases studied, natural transmission by means of an insect vector is known for only elm phloem necrosis. All four diseases can be experimentally transmitted by grafting.

Research is continuing to probe for a better understanding of pathologic activities in diseased tissues, new insect vectors, selections and hybrids of elm that are resistant to elm phloem necrosis, and methods to control the diseases.

Scientists Discover A New Multifunctional Enzyme System. An unusual enzyme complex from a wood decay fungus has recently been isolated and identified at the Forest Products Laboratory. The fungus Poria placenta produces enzymes capable of breaking apart complex carbohydrates as well as short chain sugar molecules. Such a multifunctional capacity in an enzymes system has previously been unknown. In addition to the uniqueness of this system, another feature is that the production of additional enzyme by the fungus is not regulated by the end product produced (i.e., simple sugar). In most other known systems, the end product of an enzyme system inhibits the production of additional enzyme. Therefore, the fungus can continually synthesize the appropriate enzymes and produce large amounts of simple sugars from complex carbohydrates such as cellulose; this ability makes a continuous conversion of wood to simple sugars feasible.

Information on the manner in which fungi decay wood is critical to the development of new non-toxic means of controlling wood decay fungi through inhibition of enzymatic action. Of equal importance is the possible application of such information in the fungal conversion wood waste to energy sources (alcohol) or to livestock feeds.

Heat-Shock Fungi May Stabilize Soil. Excessive erosion and its associated flooding are a common occurrence following fires in California's chaparral.

Erosion rates of as much as 35 times normal can be expected in these areas during the first year following a fire. Such erosion is a serious problem because over half of California's major urban areas lie in or adjacent to the chaparral zone. Federal, State, and local agencies spend millions of dollars each year on erosion control and post-fire land rehabilitation.

Within a few days after a fire, several species of microfungi have been observed growing over and through the soil. They are present because other organisms have been removed by the fire. It is thought that the mycelium of these fungi might stabilize freshly burned soil through the aggregation of soil particles by hyphae. This would make the soil more resistant to raindrop impact, one of the most powerful eroding agents on burned catchments. This experiment is the first of a planned series designed to: (1) determine whether or not naturally occurring heat-shock fungi play a role in mitigating erosion by raindrop impact, (2) determine the significance and extent of this role, and (3) to see if their effectiveness can be enhanced by inoculating additional spores. The fungus used in this first trial was Aspergillus fischeri var. glober. Results so far show distinctly higher erosion rates in sterile soil than in soil with the fungi growing in it. Four other naturally occurring species of fungi also appear promising.

Starve the Beetles--Save the Trees. Researchers at the Intermountain Station have developed timber harvesting prescriptions that will help save lodgepole pine stands from devastation by the mountain pine beetle. Past studies have shown that the use of chemicals and massive timber salvage operations will not alter the course of an epidemic or reduce the loss of trees. Recent research indicates that the key to managing this destructive forest pest is preventive action before the outbreak of an epidemic. The mountain pine beetle prefers large trees with thick phloem. When these trees are removed from a stand, the beetle's food supply is reduced and the population cycle, which eventually leads to epidemic outbreaks, is interrupted.

The preventive prescriptions show strong promise of warding off beetle infestations while protecting other resource values.

Rapid Response of Sawfly Destruction. Fast work by insect control specialists and Southeastern Station entomologists is minimizing damage to white pines in the Southern Appalachians by a newly established pest. Since the introduced pine sawfly was first found in the United States early in this century, it spread through the Northeast and Lake States, but was not present in the South. The introduced pine sawfly is capable of killing and severely damaging white pines, which contribute much to the esthetics of the Southern Appalachians. Christmas tree plantations which represent large investments are also threatened. Fast action was needed to determine the size of the infested area and to develop a satisfactory method of control.

Traps designed to lure and capture male sawflies were deployed in white pine stands in North Carolina, Tennessee, and Virginia. The traps contained a sex attractant or pheromone which Station entomologists extracted

from virgin female sawflies. By this procedure, it was found that about 6,000 square miles are now infested--a big increase in the last year.

Examination of sawflies captured in North Carolina showed that parasitic insects present in the Lake States were absent from the South. Two species that help to keep introduced sawflies in check in Wisconsin were brought to a specially equipped laboratory at Linville Falls, North Carolina, in the spring of 1980. By August 1, approximately 100,000 of these parasites had been reared and released.

It is too early to know what the full effect of these parasites will be, but entomologists are optimistic. Already they see an increase of 10 percent in mortality of sawflies caused by parasites. They are convinced that growth of the pest's population has been slowed. Since parasites are effective in the North, scientists believe they will also control sawflies in Southern Appalachians.

B.t. Improvements for Pest Management. The use of biological control measures, primarily microbial, in the management of gypsy moth and spruce budworm pest populations is a primary goal of the Northeastern Station in conformance with Departmental policy. Prior use of microbial materials, particularly Bacillus thuringiensis, (B.t.), had indicated tremendous potential. At the same time erratic results often were obtained when attempting to control either the gypsy moth or the spruce budworm with this kind of biological control material.

New research conducted in the Hamden, Connecticut, Forest Insect and Disease Laboratory has identified several strains of B.t. not now commercially available that exhibit much higher levels of activity than the commercially available strain. These strains appear to be from two to twenty times more potent against gypsy moth larvae and spruce budworm larvae. Commercial interests are eager to make these new strains available for field evaluation.

The discovery and implementation of more potent strains of B.t. for use against both these forest insect pests make the prospect of better efficacy and more uniform activity of these materials feasible. As far as is known, the Hamden unit is the first to identify these more active strains. Usefulness of the new strains in the field remains to be demonstrated but there is a very great possibility that some of the present problems of B.t. in pest management systems for the gypsy moth and spruce budworm may be solved.

Renewable Resources Evaluation and Economics Research

Provides information on and analysis of the location and condition of forests and forested rangelands in the United States. Includes analysis of present and anticipated uses, demand for, and supply of renewable natural resources. Collectively supplies much of the technical data and analysis needed to prepare the periodic Renewable Resources Assessment as specified by the Forest and Rangeland Renewable Resources Planning Act of 1974 and the National Forest Management Act of 1976. Economics research provides economic and financial analyses of timber growing, harvesting, processing, and distribution. Includes analyses of ways to reduce obstacles to improved

renewable natural resources management. Such obstacles include taxation, ownership patterns, or other institutional aspects. Conducts studies of uses and demands for forest products including foreign trade patterns. Develops guidelines and methodologies for multiple-use management decisions.

Forest Land Ownership Shifts. A continuing concern in the United States is the conversion of rural lands to other uses, particularly urban oriented. Pacific Northwest Station researchers analyzed private land ownership and use changes in western Oregon between 1962 and 1975 and found that approximately 210,000 acres of the 6.4 million acres of timberland were converted to other uses--primarily pastures and other agricultural uses. During this same period the forest industry purchased 280,000 acres of timberland mostly from farmers and other private owners. While this land did not contain large volumes of timber, it had higher than average tree growing potential (site quality). As a consequence of these shifts in land ownership and use, forest industry timberland area has increased 7 percent while farmer and other private timberland area has decreased 15 percent.

Remote Sensing Is An Important Tool for Assessing Wildland Resources.

Remote sensing has been used in wildland resource inventories for several decades but the technology has expanded greatly in recent years. A recent evaluation of current remote sensing technology makes it possible for inventory planners and managers to more easily choose the best techniques to satisfy their needs. The study systematically examined the characteristics of most remote sensing media including photographic and non-photographic data such as microwave, radar, thermal infrared, ultraviolet and multispectral scanner data. These information sources were described in terms that allowed evaluation for wildland application.

Disease Losses in North Carolina Forests. Although diseases, insects, and other damaging factors limit the productivity of North Carolina Forests, recent data on the incidence and amount has not been readily available. A new assessment indicates that suppression and stagnation, fusiform rust, and heart rot were the primary causes of damage to softwoods. The study was conducted as part of the recently completed forest survey of the state.

Damage attributed to suppression and stagnation was most prevalent on young trees. Insects, animals, other diseases, and weather also took their toll, but were not serious factors affecting the trees that remained.

Electronic System Speeds Multi-Resource Inventory of Midsouth Forests.

Continuous inventory of Midsouth forests requires the recording and processing of more than two million observations from field plots annually. In the past, each entry was manually recorded on a tally sheet, visually checked, and mailed to headquarters for keypunching, verification, and submission to a computerized edit program for error detection. This procedure usually took about 3 months, and timely advice to field crews about error sources was virtually impossible.

Scientists and data processing specialists in the Renewable Resource Evaluation unit at New Orleans have integrated electronic components into a system that appreciably speeds up the process, reduces errors, and minimizes paperwork. A field crew now punches entries into a hand-held

data recorder--a device similar to that commonly used by supermarket stock clerks. Each recorder holds up to 16,000 characters of information--the equivalent of data entries from five field plots. Once recorded, the data are electronically converted to audible signals and transmitted by telephone line to unit headquarters where data-acquisition equipment receives and magnetically stores the information. After being edited, results can be transmitted back to the field where a portable terminal receives and prints out the data for review by crew leaders who discern sources of errors and inconsistencies. The system eliminates laborious tasks of keypunching, verifying and transcribing data. The new system is a vital step toward attaining the Station's goal of reducing the seven-state inventory to a 5-year cycle.

Energy From Dead Trees? Yes! A study in the Blue Mountain area of eastern Oregon showed that the overall energy input to harvest, transport, and deliver wood fuel from dead lodgepole trees was less than 5 percent of the gross energy content of the delivered fuel. Furthermore, chips from dead lodgepole may be delivered as fuel at a cost that is competitive with the price of western coal in terms of comparative energy value.

Researchers at the Pacific Northwest Station and the Forest Products Laboratory evaluated the Blue Mountain area of eastern Oregon, which contains approximately 12 million tons (dry basis) of standing lodgepole, which accumulated as a result of bark beetle epidemic in the 1970's. Insect-infested timber can be harvested before stand deterioration or fire occurs. Dead timber is often of low quality with limited potential for conventional products, but might be used for fuel or chip products.

Experimental harvest operations indicated that whole-tree chipping of the dead lodgepole may be the least costly method of harvesting.

What About National Forest Timber Sales? Questions have been asked by the public concerning National Forest timber sale procedures. Are the timber purchasers getting a fair deal? Do payments to the U.S. Treasury for timber reflect its true value? Scientists at the Pacific Northwest Experiment Station are trying to answer some of these questions by analyzing National Forest System timber sales data.

The Small Business Administration set-aside program is designed to provide special opportunities for small forest industries to compete for timber from the National Forests. An analysis of this program in the Douglas-fir region revealed that only in southwestern Oregon does this program provide a subsidy to small forest industries. Elsewhere in the region both regular and set-aside timber sales have comparable prices.

An analysis of sealed versus oral bidding for timber sales in the Douglas-fir region showed that the number of bidders and the price of the timber both increased when oral bidding procedures were changed to sealed bidding. Results of this research will be useful in shaping policies affecting National Forest System timber sales.

Visual Quality and Cost of Growing Trees. What is the view of an attractive forest landscape worth? While we do not have estimates of what it is worth, we can measure the increase in management costs that must be incurred to achieve a more attractive landscape. Lands designated for one degree of esthetic protection on the Mt. Hood National Forest in Oregon produce the same amount of wood as standard timberlands, but incur additional costs for each management activity--primarily for more thorough cleanup of debris. This increase in cost is equivalent to approximately \$2.00 per acre each year throughout the life of the forest. This implies that the more attractive landscape must be worth at least \$2.00 per acre per year more than the "standard" landscape in order to justify that management. If this degree of esthetic protection is taken to be part of the cost of producing timber from these lands it would represent about a 14 percent increase in the direct cost of growing and harvesting timber.

Productivity From Better Information. To help provide quantitative product market information on the future consumption and prices, econometric models were developed by the Northeastern Station to quantify the domestic and foreign factors affecting the Nation's supply and demand for insulation board, hardboard, and pallets. The models mathematically explain the supply-demand interrelations within each market and provide flexible techniques for making annual consumption and price forecasts. The models will (1) add clarity, objectivity, and flexibility to the study of wood products markets; (2) allow measurement of the cause and effect of changes within the market; and (3) permit determination of the impact of market change.

These data are valuable to decisionmakers when formulating forest policies and programs, establishing long-run timber production and multiple-use goals; and assessing the domestic impact of export and import questions.

Estate Planning for Forest Landowners. Death taxes, once of little importance to most non-industrial landowners, have received increasing attention in recent years. Rising property values and inflation have made the federal estate tax, in particular, a significant item for many persons--including timberland owners. When a forest landowner dies, heirs often have to make premature timber harvests or are forced to sell part or all of the land in order to pay estate taxes.

The 1979 Tax Reform Act contains features designed to lower Federal estate taxes. It provides an opportunity for reduction, in certain situations, of estate taxes on real property held jointly by husband and wife. The procedure involves making lifetime gifts between spouses of jointly owned property rights. Using a realistic forest ownership example, researchers from Oregon State University and the Southern Station analyzed the application of the new law to timberland owners and illustrated how a spouse could save over \$33,000 in estate taxes under this provision. Proper utilization of the techniques involved can reduce the need for liquid assets at death and thus lessen disturbance to the continuity of forest ownership and sound timber management.

Forest Products Utilization and Engineering Research

Determines the characteristics of wood as a basic raw material for industrial use and improves methods and techniques for its use. Improves wood products through better design and more efficient use of materials. Develops new and more efficient processes for manufacturing wood products through materials research, improvement of processing equipment, reduction of waste, and conservation of manufacturing energy. Engineering research, leads to improved engineering aspects of wood harvesting and transportation systems through operations research, methods analysis, equipment design, and pilot testing. Protects quality of timber stands and watersheds, provides for reestablishment of forests and improvement of timber stands, and maintains quality of the forests for multiple use. Develops harvesting systems to remove some of the barriers to increased use of small and low-quality timber, dead or dying timber, and forest residues--particularly as an energy source.

Press Drying Allows Wider Use of Hardwoods for Paper Manufacture. Press drying, a revolutionary concept developed at the Forest Products Laboratory, allows paper manufacturers, for the first time, to use 100 percent hardwood pulp for linerboard and ease the demand for softwood species which are in short supply. Over one-half of the timber harvested in the United States goes into paper manufacture. Of this, one-half is used to produce linerboard.

Utilizing heat and pressure to bond pulp fibers together, the process eliminates the need for longer, but scarcer, softwood fibers for strength as is currently required for conventional linerboard. In addition, press drying permits use of less refined, higher yield pulp (60 to 70 percent or higher) without sacrificing product performance. Conventional processes presently use pulp with yields of around 53 percent. And, since the pulp needs less refining and the paper sheet requires less drying heat, energy requirements should be reduced.

The demand for softwood timber has increased in recent years since softwoods are preferred for both lumber and pulp manufacture. Because the demand for hardwood timber is less, surplus supplies of these species are available, particularly in the eastern part of the United States.

New Reference Book Will Help Users of Tropical Species. The physical and mechanical properties of 370 tropical species from America, Africa, Southeast Asia, and Oceania are compiled, evaluated, and interpreted in an 830-page book, "Tropical Timber of the World."

Properties are categorized and cross-referenced to permit comparison of woods and to relate woods to specific end uses. Primary users will be industrial manufacturers and marketing specialists seeking sources of wood from among the hundreds of tropical species. This book will also serve as a major reference for scientists and educators who need a comparative base for specific technical analyses. The book is available from National Technical Information Service, Springfield, Virginia 22161.

Harvesting Practices and The Forest Ecosystem. Timber harvesting is the most significant management tool available to the forest managers. The Intermountain Station, working with resource managers, have evaluated alternative timber harvesting practices that will help maintain productive forests. The results of several years of research and a symposium are published in *Environmental Consequences of Timber Harvesting*, a 526-page compendium that summarizes most of the available information on alternative timber harvesting practices in the northern Rocky Mountains. This compendium answers questions on esthetics, fire management, insect and disease control, stand regeneration and development, and other forest management concerns.

Powered Back-Up Rollers Save Veneer. Powered back-up rollers developed at the Forest Products laboratory are designed to eliminate "spin-out" on veneer lathes. This "spin-out" occurs when the amount of lathe torque created by the cutting knife exceeds the strength of the wood at the ends of the log. When that strength is exceeded, the wood fails and the chucks spin free, rendering the log useless for veneer peeling. Currently "spin-out" occurs in 5 to 8 percent of the logs peeled for veneer. In conventional veneer peeling, a log is rotated against a fixed knife by means of chucks embedded in the ends. Since plywood accounts for 80 percent of the value of all U.S. panel products, "spin-out" represents a significant loss of valuable timber.

Logs with soft centers, once considered unpeelable, can now be utilized, thus expanding the resource base. The back-up rollers allow the use of smaller chucks, thus the veneer yield is increased because the core diameter is reduced. This new process will also facilitate peeling thicker veneers, which can be used in new products of the future.

The powered back-up device consists of a set of two hydraulically powered rollers, which turn against the outer surface of the log while it is being peeled, and assist the chucks in providing torque. A hydraulic cylinder holds the back-up rollers in contact with the log with a constant pressure.

Predicting Product Potential of Young Hardwood Stands. It is important for forest managers to be able to estimate quality development as well as growth in potentially high value hardwood stands so the total effects of cultural treatments can be evaluated. There has not been an objective way of estimating the future product potential of young hardwood stands. Initial study results at the Northeastern Station show that individual tree characteristics important in predicting product potential and relative quality can be counted and combined to describe a tree or stand.

By measuring or estimating tree size, crown ratio, stem curvature, limb-related defect counts, and internal defect, several different types of tree and stand summaries can be produced that reflect the relative quality potential of sapling and pole-sized stands. Researchers now are using these results to characterize and classify the relative quality of trees on culturally treated research plots in order to predict the change in quality characteristics over time and relate this to changes in product potential.

Optimizing Millwork and Moulding Product Yields. Clear lumber for millwork and mouldings has always been in short supply despite high prices for the final product. About 1.3 billion board feet of lumber is annually processed for high-value moulding and millwork products. Research at the Forest Products Laboratory and the Pacific Northwest Experiment Station has now resulted in a means of determining the yield of such products from mixed grades of lumber. The procedure developed permits greater utilization of lower grade material because the predicted yields will allow firms to alter their mix of lumber grades to suit market conditions.

In developing this procedure, over 50,000 board feet of No. 3 and better shop grade 5/4 Ponderosa pine lumber was manually measured and defect data recorded for computer processing to maximize cutting yields.

A Unique Chipping Process for Residues. A new chipper with a spiral cutting blade has been developed to produce chips or chunks of wood 2-3 inches long. This chipper provides material that can be used for flakeboard or fuel.

Conventional chippers produce chips that are too small to be converted to flakes suitable for exterior grade structural flakeboard. Further experimentation with these larger chips or chunks has revealed another, perhaps even more important, use for them. Their size gives them certain advantages over conventional pulpwood chips for use as fuel. For some types of industrial combustors, the chunkwood produced by the spiral-head chipper may be cheaper to produce, and easier to store and handle, and they may dry better, burn better, and mix with coal better. And, because a portable version can be mounted on a tractor, thinnings and logging residue, material that otherwise might be wasted, can be more readily utilized. It can also serve as a compact, low-cost machine for the farmer or woodlot owner to use in managing his timber and for producing fuel for home use.

A New Low Cost Cable Yarder For Steep Terrain. The Appalachian Thinner, a new cable yarder, has the necessary mobility to be used economically in selection cuts on small woodland properties. This machine, designed and fabricated at the Northeastern Forest Experiment Station, consists of a single drum winch mounted on a knuckleboom loader assembly that attaches with a quick disconnect mounting bracket to a crawler tractor. This cable yarder has excellent mobility because it requires no guylines.

Principal features and preliminary production figures of the yarder working in a clearcut, a diameter limit thinning and a sanitation thinning have been presented in a popular brochure. Also, the Appalachian Thinner is being loaned to logging contractors to demonstrate its advantages. Data are being collected to determine the production obtained with different crews working on various kinds of terrain.

International Forestry

Provides leadership, coordination, and direction for Forest Service cooperation and participation in international forestry programs such as the Man and the Biosphere Program and tropical forestry initiatives.

Arranges for the Forest Service to provide technical assistance to developing countries through the Agency for International Development (AID) and the Food and Agriculture Organization (FAO) of the United Nations. Is responsible for all Forest Service, science and technology bilateral agreements, including arranging for the exchange of scientists and publications. Maintains liaison for all special Foreign currency research program projects in forestry (under P.L. 480). Facilitates training for all foreign visitors, international organizations, and other forestry agencies throughout the world, such as those in Canada, Mexico, Brazil, Japan, and Spain.

Scientific and Technological Exchange. Participation in international meetings and other cooperative programs of exchange is highly beneficial to scientists and managers of Forest Service programs. More than 200 instances of such were accomplished during fiscal year 1980, including more than one-half that number in workshops and technical exchange activities growing out of our closely cooperative work relationships with Mexico and Canada. New exchanges in forestry and forestry-related areas were initiated with the Peoples` Republic of China and Brazil.

Development Assistance. Forest Service specialists are regularly called upon to furnish technical support to United States programs of assistance to developing nations. During the year, ten Forest Service specialists provided short-term consultant services to overseas missions of the U.S. Agency for International Development (AID) and the Food and Agricultural Organization of the United Nations (FAO). Eight others served on resident assignment to such missions. The Forest Service developed and negotiated agreement with the U.S. Agency for International Development to establish and manage a technical support network to serve that agency`s worldwide program of forest resources management.

Training at Forest Service field units and WO Headquarters was provided for 105 foreign nationals sponsored by either AID or FAO. (Additionally, more than 100 itineraries for observational visits were prepared and coordinated in response to requests from self-financed or country-sponsored visitors from more than 30 nations.)

Research Cooperation. Much foreign-based research is directed toward solution of problems of importance to the United States. The Man and Biosphere (MAB) Research Program, of the United Nations Educational, Scientific and Cultural Organization (UNESCO), encompasses several areas of research of direct interest to United States scientists. The Forest Service initiated a consortium of Federal agencies to support selected areas of the MAB program. In addition to support funding, one Forest Service scientist serves on assignment to MAB headquarters in Paris, and another provides full-time support to the secretariate for United States MAB Committee.

HUMAN RESOURCE PROGRAMS

Introduction

The Human Resource Programs conducted by the U.S. Department of Agriculture, Forest Service, strive to achieve a blending of human and natural resources. These programs serve the unemployed, underemployed, minorities, economically disadvantaged, youth, and the elderly through forestry activities. Human resource programs provide employment, skills training, experience, and education for both young and old persons. These programs also contribute substantially to improvement of facilities and the management of public Forest and rangelands (table 1, page 66).

During fiscal year 1980, \$264.45 million was allocated the Forest Service to provide employment in four major programs: Youth Conservation Corps, Young Adult Conservation Corps, Job Corps, and Senior Community Service Employment Program. The Young Adult Conservation Corps provides year-round jobs for unemployed and out-of-school young men and women between the ages of 16 and 23. The Youth Conservation Corps provides summer employment for 15 through 18-year-old youths from all segments of society. The Job Corps program provides disadvantaged young people with both educational and vocational training. The Senior Community Service Employment Program provides supplemental income, work experience, and skills training to economically disadvantaged seniors aged 55 and older.

Four major programs and unfunded programs, including a volunteer program and programs hosted by the Forest Service, helped the Forest Service meet the social goals of the program and accomplish resource improvement work as a valuable by-product. These programs administered by the Forest Service and those conducted by State and local agencies through Federal grants provided employment and skills training to 127,640 persons during the year. The amount of work accomplished by these programs equaled 26,602 person-years and was valued at \$280 million.

Youth Conservation Corps

The Youth Conservation Corps provides summer employment for 15 through 18-year-old youths from all segments of society to do needed conservation work on public lands. In addition to employment and conservation work, a third objective of the program involves environmental education. The Corps is jointly administered by the Departments of Agriculture and Interior. The Departments also share responsibilities for administering grants to all States and territories. In fiscal year 1980, an estimated 10,800 young persons participated in camps administered by the Forest Service. Of this total, approximately 48 percent were female and 20 percent were minorities. Participants accomplished 1,573 person-years of conservation work/environmental education valued at approximately \$23 million. The types of work accomplished were campground and trail construction and rehabilitation, insect control, tree planting, boundary corner search and range fence construction. For each appropriated YCC dollar invested, approximately \$1.20 worth of work/education value was accomplished.

Young Adult Conservation Corps

The Young Adult Conservation Corps is a Department of Labor program that provides year-round, labor intensive conservation work to unemployed and out-of-school youth aged 16 to 23. All Forest Service Regions, Stations, and Areas, as well as the Soil Conservation Service are involved.

The program is administered under a tripartite agreement between the Departments of Agriculture, Interior, and Labor. Seventy percent of the total funds have been divided equally between Agriculture and Interior. The remaining 30 percent provides a fully funded State grant component which is jointly administered by the Departments of Agriculture and Interior. These funds are made available to the States to support the Young Adult Conservation Corps programs on State and local public lands. Allocation of grant funds for this program is based on the total youth population of each State.

During fiscal year 1980, the Forest Service provided employment opportunities for 24,865 enrollees. Of this number, 25 percent were minorities and 33 percent were women. The \$82.5 million funding (less a \$6.8 million carrying to 1981) generated 6,796 person-years of valuable conservation work including firefighting, firebreak construction, trail and campground construction, tree planting, timber stand improvement, and range fence construction. Participants accomplished \$83 million worth of work, representing a \$1.10 return for each dollar spent.

The State grant program, funded at \$70.5 million in fiscal year 1980, produced 6,479 person-years of work valued at \$72.5 million of much needed conservation work. For every dollar spent, \$1.15 of work was accomplished. Of the 33,000 enrollees served in the State Grant program, 29 percent were minorities and 35 percent were women.

Job Corps

The Job Corps is a Department of Labor job skills training and education program for disadvantaged youths ages 16 to 21. Enrollees receive room, board, clothing, skills training, education, and a monthly allowance in lieu of wages. The Forest Service administers 18 Civilian Conservation Centers under an interagency agreement with the Department of Labor.

In fiscal year 1980, \$41.25 million in funding was received to serve 8,805 youths. Of this total, 53 percent of the corpsmembers were minorities and 4 percent were women. Our Civilian Conservation Centers primarily produce graduates who are able to find productive work, re-enter school, or join the military. In fiscal year 1980, 93 percent of the corpsmen were successful. Ten percent received General Equivalency Diplomas. We attribute our graduates' successes to the development of good work habits and special job skills and to education obtained in the program.

The by-product of enrollee skills training last year resulted in 3,922 person-years of conservation work, valued at \$14.7 million; \$2.7 million of this total was resource work and construction on National Forests.

Corpsmen were involved in such activities as firefighting, construction and rehabilitation of structures, road construction, water impoundments, and timber stand improvements.

Senior Community Service Employment Program

The Forest Service, in cooperation with the Department of Labor, sponsors the Senior Community Service Employment Program (SCSEP). The SCSEP provides part-time employment, work experience, and skills training to economically disadvantaged seniors, aged 55 and older, who reside primarily in rural areas.

Program participants are involved in projects on National Forest lands such as recreation area and trail construction, rehabilitation, maintenance, natural resource improvement work, map work, and clerical support. Enrollees receive at least the minimum wage to supplement their personal incomes. A major benefit of the SCSEP program is the opportunity participants have to regain a sense of involvement with the mainstream of life through meaningful work. Additionally, valuable conservation projects are completed on National Forest lands.

Our July 1, 1980, through June 30, 1981, an Interagency Agreement (for fiscal year 1980) with the Department of Labor provided funding of \$15.4 million which maintained the program at the previous year's level. We anticipate serving 4,250 seniors; and expect that 33 percent will be women and 19 percent will be minorities. These senior workers should accomplish 2,200 person-years of conservation work valued at more than \$21.2 million. For each dollar invested in the program, we anticipate reaping \$1.43 worth of conservation work.

Volunteers in the National Forests

The Forest Service also conducts a program whereby groups or individuals may donate their time to preserve and conserve our national resources. Although the Volunteers in the National Forests program does not provide compensation to participants, it allows unlimited opportunities for interested persons to contribute their talents, knowledge, and expertise toward the enhancement of Forest Service activities. The Volunteers program is not directly funded, however, the Forest Service benefiting activities are utilized to support the use of volunteers. During fiscal year 1980, 15,550 persons participated in the Volunteers program. Approximately 36 percent were women and 15 percent were minorities. Participants contributed 644 person-years of work valued at more than \$5.9 million.

Hosted Programs

The Forest Service additionally serves as a host agency for cooperative programs administered by State and local governments. Hosted human resource programs include College Work Study, Work Incentive Program, Vocational Work Study, and programs authorized by the Comprehensive employment and Training Act. During the 1980 school year, 8,170 persons participated in these cooperative programs; approximately 32 percent were women and 30 percent were minorities. Program participants accomplished 1,615 person-years of conservation work valued at more than \$17 million.

Table 1.--Summary of Human Resource Programs--fiscal year 1980

Program	Program funding (\$Millions)	Value of work accom- plished (\$Millions)	Number of persons served	Percent women	Percent minority	Person- years accom- plished	Percent place- ment	Dollar investment return
Youth Conservation Corps								
Forest Service	19.18	23.0	10,800	48	20	1,573	-	\$1.20
Dept. of the Interior	19.18	23.0	10,800	48	30	1,573	-	1.20
State Grants 1/	16.44	19.7	11,400	46	23	1,800	-	1.20
Total	54.80	65.7	33,000	47	24	4,946	-	\$1.20
Young Adult Conservation Corps								
Forest Service	82.5 2/	83.0	24,865	33	25	6,796	-	\$1.10
State Grants 1/	70.5	72.5	33,000	35	29	6,479	-	1.15
Total	153.0	155.5	57,865	-	-	13,275	-	-
Job Corps	41.25	14.7	8,805	4	53	3,922	93	-
Senior Community Service Employment Program 3/								
	15.4	21.2	4,250	33	19	2,200	-	\$1.43
Volunteers in the National Forests								
	Unfunded	5.9	15,550	36	15	644	-	-
Hosted Programs								
	Unfunded	17.0	8,170	32	30	1,615	-	-
Total all programs								
Forest Service	158.33	164.8	72,440	-	-	16,750	-	-
Dept. of Interior (YCC)	19.18	23.0	10,800	-	-	1,573	-	-
State Grants 1/	86.90	92.2	44,400	-	-	8,279	-	-
Total	264.45	280.0	127,640	-	-	26,602	-	-

1/ Jointly administered by the USDA-Forest Service and the Department of the Interior.

2/ Includes approximately \$6.8 million carryover into fiscal year 1981.

3/ Statistics are projected for the July 1, 1980 - June 30, 1981 program year.

APPENDIX A
INTRODUCTION

APPENDIX A 1

Table A 1.1.--Statement of receipts--fiscal year 1980 (dollars in thousands)

Receipts	National Forests	Oregon and Calif. grant Lands	National Grasslands & L.U. Areas	Other	Total
<u>Receipts from Sale and Use of Forest Resources</u>					
Timber & Forest Products	600,333	25,063	11		625,407
Grazing	13,973	1	1,876		15,850
Land Uses	2,205	7	124		2,336
Recreation	18,308		9		18,317
Power	459		29		488
Minerals Leases and Permits	20,160		20,312		40,472
Total	655,438	25,071	22,361		702,870
<u>Receipts from Deposits for Expenditures on NF's</u>					
Timber Sale Area Betterment	116,576				116,576
Timber Salvage Sales	14,530				14,530
Brush Disposal	42,374				42,374
Restoration of Improvement	198				198
Cooperative Work	29,985				29,985
Total	203,663				203,663
<u>Other Receipts</u>					
Misc. (sale, rents, etc.)				1/ -2,375	1/ -2,375
Golden Eagle Passports				5	5
Sale of Personal Property				47	47
Cooperative Research				587	587
Royalties from Sale of Smokey Bear and Woodsy Owl Products				102	102
Total				1/ -1,634	1/ -1,634
<u>Other Income</u>					
Estimated collections by Dept. of Energy for power licenses on Public Domain National Forest land	86				86
Estimated collections by Dept. of Interior for Mineral Leases on Public Domain National Forest land	219,264				219,264
Estimated value of roads built by timber purchasers in lieu of cash	164,226				164,226
Total	383,576				383,576
Grand Total	1,242,677	25,071	22,361	1/ -1,634	1,288,475

1/ Includes Receipt account adjustment of \$2,700,000 from previous fiscal year.

Table A 1.2.--Statement of expenditures--fiscal year 1980 (dollars in thousands)

Expenditures	Total	Work for others
<u>National Forest System (NFS)</u>	<u>1980</u>	<u>1980</u>
Protection and Maintenance	656,114	12,557
Fighting Forest Fires	69,190	4,449
Road and Trail Maintenance	84,809	139
Cooperative Law Enforcement	5,141	2
Flood Prevention & Watershed		
Protection	5,241	--
Restoration of Forest Lands	104	104
Reforestation & Timber Stand Improvement	101,865	85
Timber Sales Settlement (K-V)	80,579	11
Brush Disposal	43,730	9
Timber Salvage Sales	11,899	9
Oregon-California Grant Lands	6,020	--
Land Planning Alpine Lakes	20	--
Construction and Operation of		
Recreation Facilities	159	--
Range Improvement	5,565	--
Construction of Facilities	28,102	545
Acquisition of Lands,		
Forest Service	2,326	--
Acquisition of Lands, L&W		
Conservation Fund	70,332	--
Construction of Forest Roads & Trails	236,577	448
Purchaser Elections Road Construction	54,219	--
Timber Purchaser Road Construction	201,656	--
Restoration of Roads - Federal Highway Trust	15,262	--
Cooperative Work for Others	23,012	23,012
Mount St. Helen's Emergency Activities	7,354	1
Highland Scenic Highway	83	73
<u>Total NFS</u>	<u>1,709,359</u>	<u>41,444</u>
<u>Research</u>		
Research	113,528	3,806
Research Construction	2,589	24
Cooperative Research	1,059	1,059
Gifts, Donations, and Bequests for		
Forest & Rangeland Research	59	59
<u>Total Research</u>	<u>117,235</u>	<u>4,948</u>
<u>State & Private Forestry (S&PF)</u>		
S&PF Operations	52,138	551
Insect and Disease Management	25,368	1,505
Titles IV Assistance to States Tree Plan	(38)	--
Resource Conservation and Development (RC&D)	886	--
Rural Community Fire Program (RCFP) Grants	3,469	--
River Basins	1,720	35
Flood Prevention and Watershed Planning	2,416	2
Licensee Programs, Smokey Bear and Woodsy Owl	59	--
Forestry Incentives Program (FIP)		
Resource Conservation Program (ACP) & misc.	4,088	636
<u>Total S&PF</u>	<u>90,106</u>	<u>2,729</u>
<u>Human Resource Programs</u>		
Youth Conservation Corps	19,934	46
Job Corps	41,680	188
Young Adult Conservation Corps (YACC)	77,758	80
Senior citizens and miscellaneous	15,442	81
<u>Total HRP</u>	<u>154,814</u>	<u>395</u>
<u>Grand Total--Forest Service</u>	<u>2,071,514</u>	<u>49,516</u>

APPENDIX A 2

Table A 2.1.--Numbers of employees in major occupation series and changes
between 1975 and 1980^{1/}

Occupation	Series	Number on Rolls		Percent Change
		1975	1980	
<u>Resource Specialists</u>				
Forester	460	4,616	4,686	+ 02
Range Conservationist	454	260	294	+ 13
Subtotal		4,876	4,980	+ 04
<u>Resource Support Specialists</u>				
Entomologist	414	153	170	+ 11
Plant Pathologist	434	97	95	- 01
Soil Scientist	470	173	210	+ 21
Wildlife Biologist	486	119	214	+ 80
Landscape Architect	807	170	188	+ 11
Hydrologist	1315	107	154	+ 44
Subtotal		819	1,031	+ 26
<u>Other Support Specialists</u>				
Accountant	510	123	123	0
Civil Engineer	810	966	946	- 02
Subtotal		1,089	1,069	- 02
Subtotal Professional		6,784	7,080	+ 04
<u>Technical Personnel</u>				
Social Services	186	145	273	+ 88
Biological Technician	404	145	183	+ 26
Forestry Technician	462	3,182	3,969	+ 25
Engineering Technician	802	1,256	1,444	+ 15
Construction Inspector	809	256	183	- 29
Survey Technician	817	115	138	+ 20
Electronics Technician	856	148	181	+ 22
Cartographic Technician	1371	116	156	+ 34
Forest Products Technician	1380	117	106	- 09
Subtotal		5,480	6,633	+ 21
<u>Administrative</u>				
Personnel Management	201	164	200	+ 22
General Clerical and Administration	301	1,006	1,107	+ 10
Computer Specialist	334	126	212	+ 68
Administrative Officer	341	236	199	- 19
Contract and Procurement	1102	225	285	+ 26
Subtotal		1,757	2,003	+ 14
<u>Clerical</u>				
Personnel Clerical	203	263	284	+ 08
Secretary	318	340	373	+ 10
Clerk Typist	322	413	360	- 15
General Accounting	501	108	99	- 08
Purchasing	1105	142	169	+ 19
Subtotal		1,266	1,285	+ 02
Subtotal Nonprofessional		8,503	9,921	+ 17
Subtotal Major Series		15,287	17,001	+ 11
Agency Total		19,850	21,341	+ 07

^{1/} Major series are defined as having 100 or more full-time personnel, series 434 excepted.

APPENDIX B

NATIONAL FOREST SYSTEM PROGRAM

APPENDIX B 1

Table B 1.1.--National Forest System lands by States administered by the Forest Service as of September 30, 1980 (acres)

State and commonwealth	National Forest purchase units, research areas, and other areas	National Grasslands	Land utilization project	Total
Alabama	643,792	0	40	643,832
Alaska	19,948,034	0	0	19,948,034
Arizona	11,270,714	0	0	11,270,714
Arkansas	2,476,206	0	0	2,476,206
California	20,350,469	0	19,222	20,369,691
Colorado	13,801,474	612,145	560	14,414,179
Connecticut (Forest Insect and Disease Lab.)	10	0	0	10
Florida	1,097,930	0	0	1,097,930
Georgia	853,555	0	9,340	862,895
Hawaii	1	0	0	1
Idaho	20,375,171	47,659	0	20,422,830
Illinois	260,727	0	0	260,727
Indiana	185,855	0	324	186,179
Kansas	0	108,175	0	108,175
Kentucky	667,327	0	0	667,327
Louisiana	597,665	0	0	597,665
Maine	50,977	0	260	51,237
Michigan	2,727,301	0	999	2,728,300
Minnesota	2,796,091	0	0	2,796,091
Mississippi	1,140,619	0	0	1,140,619
Missouri	1,450,041	0	13,104	1,463,145
Montana	16,752,736	0	0	16,752,736
Nebraska	257,405	94,334	0	351,739
Nevada	5,146,034	0	0	5,146,034
New Hampshire	700,153	0	0	700,153
New Mexico	9,107,804	136,412	240	9,244,456
New York	0	0	13,232	13,232
North Carolina	1,162,708	0	0	1,162,708
North Dakota	796	1,104,749	0	1,105,545
Ohio	175,345	0	0	175,345
Oklahoma	246,933	46,300	0	293,233
Oregon	15,508,796	106,138	856	15,615,790
Pennsylvania	508,806	0	0	508,806
Puerto Rico	27,846	0	0	27,846
South Carolina	609,401	0	0	609,401

Table B 1.1.--National Forest System lands by States administered by the
Forest Service as of September 30, 1980 (acres) (con.)

State and commonwealth	National Forest purchase units, research areas, and other areas	National Grasslands	Land utilization project	Total
South Dakota	1,132,101	863,219	0	1,995,320
Tennessee	622,000	0	0	622,000
Texas	665,034	117,554	0	782,588
Utah	8,045,874	0	0	8,045,874
Vermont	279,873	0	0	279,873
Virgin Islands (Estate Thomas Experimental Forest)	147			147
Virginia	1,617,371	0	0	1,617,371
Washington	9,051,885	0	725	9,052,610
West Virginia	967,750	0	0	967,139
Wisconsin	1,498,773	0	160	1,498,739
Wyoming	8,680,938	572,364	0	9,253,302
Total	183,459,663	3,809,049	59,062	187,327,774

APPENDIX B 2

Land and Resource Management Plan Schedule

Tentative Dates
Subject to Change

	Regional Plan		Forest Plan	
	DES <u>1/</u>	FES <u>2/</u>	DES	FES
Region 1, Missoula, Montana	11/80	3/81		
Beaverhead, Dillon, Montana			10/81	3/82
Bitterroot, Hamilton, Montana			3/82	11/82
Clearwater, Orofino, Idaho			6/81	12/81
Custer, Billings, Montana			5/82	5/83
Deerlodge, Butte, Montana			5/82	11/82
Flathead, Kalispell, Montana			3/81	12/81
Gallatin, Bozeman, Montana			6/81	4/82
Helena, Helena, Montana			8/81	1/82
Idaho Panhandle, Coeur d`Alene, Idaho			8/81	1/82
Kootenai, Libby, Montana			5/81	9/81
Lewis and Clark, Great Falls, Montana			4/81	10/81
Lolo, Missoula, Montana			4/80	12/80
Nezperce, Grangeville, Idaho			4/81	11/81

	Regional Plan		Forest Plan	
	DES	FES	DES	FES
Region 2, Lakewood, Colorado	3/81	7/81		
Arapaho and Roosevelt, Ft. Collins, Colorado			3/81	9/81
Bighorn, Sheridan, Wyoming			3/82	12/82
Black Hills, Custer, South Dakota			6/81	3/82
Grand Mesa, Uncompahgre and Gunnison, Delta, Colorado			6/82	3/83
Medicine Bow, Laramie, Wyoming			6/82	3/83
Nebraska, Chadron, Nebraska			6/81	3/82
Pike and San Isabel, Pueblo, Colorado			6/82	3/83
Rio Grande, Monte Vista, Colorado			12/82	9/83
Routt, Steamboat Springs, Colorado			12/82	9/83
San Juan, Durango, Colorado			6/82	3/83
Shoshone, Cody, Wyoming			9/82	6/83
White River, Glenwood Springs, Colorado			12/82	9/83

	Regional Plan		Forest Plan	
	DES	FES	DES	FES
Region 3, Albuquerque, New Mexico	3/81	8/81		
Apache-Sitgreaves, Springerville, Arizona			10/82	6/83
Carson, Taos, New Mexico			10/82	7/83
Cibola, Albuquerque, New Mexico			9/82	8/83
Coconino, Flagstaff, Arizona			7/82	3/83
Coronado, Tucson, Arizona			3/81	9/81
Gila, Silver City, New Mexico			5/82	11/82
Kaibab, Williams, Arizona			4/82	12/82

Tentative Dates
Subject to Change

	Forest Plan	
	DES	FES
Lincoln, Alamogordo, New Mexico	5/82	12/82
Prescott, Prescott, Arizona	10/82	7/83
Santa Fe, Santa Fe, New Mexico	3/81	9/81
Tonto, Phoenix, Arizona	10/82	6/83
	Regional Plan	
	DES	FES
Region 4, Ogden, Utah	2/81	7/81
Ashley, Vernal, Utah	3/83	9/83
Boise, Boise, Idaho	3/83	12/83
Bridger-Teton, Jackson, Wyoming	9/81	6/82
Caribou, Pocatello, Idaho	12/81	6/82
Challis, Challis, Idaho	6/82	12/82
Dixie, Cedar City, Utah	6/82	9/82
Fishlake, Richfield, Utah	12/81	9/82
Humboldt, Elko, Nevada	12/82	7/83
Manti-LaSal, Price, Utah	6/81	3/82
Payette, McCall, Idaho	9/82	3/83
Salmon, Salmon, Idaho	2/82	9/82
Sawtooth, Twin Falls, Idaho	12/82	10/83
Targhee, St. Anthony, Idaho	3/81	9/81
Toiyabe, Reno, Nevada	9/82	6/83
Uinta, Provo, Utah	3/81	8/81
Wasatch, Salt Lake City, Utah	12/82	12/83
	Regional Plan	
	DES	FES
Region 5, San Francisco, California	2/81	7/81
Angeles, Pasadena, Calif.	9/82	3/83
Cleveland, San Diego, Calif.	9/82	3/83
Eldorado, Placerville, Calif.	7/82	4/83
Inyo, Bishop, Calif.	1/83	7/83
Klamath, Yreka, Calif.	4/81	10/81
Lassen, Susanville, Calif.	12/82	6/83
Los Padres, Goleta, Calif.	9/82	3/83
Mendocino, Willows, Calif.	9/82	5/83
Modoc, Alturas, Calif.	12/82	6/83
Plumas, Quincy, Calif.	12/82	6/83
San Bernardino, San Bernardino, Calif.	11/82	6/83
Sequoia, Porterville, Calif.	1/83	7/83
Shasta-Trinity, Redding, Calif.	6/81	10/81
Sierra, Fresno, Calif.	3/81	8/81
Six Rivers, Eureka, Calif.	5/81	10/81
Stanislaus, Sonora, Calif.	7/82	4/83
Tahoe, Nevada City, Calif.	7/82	4/83

Tentative Dates
Subject to Change

	Regional Plan		Forest Plan	
	DES	FES	DES	FES
Region 6, Portland, Oregon	2/81	7/81		
Colville, Colville, Washington			5/83	5/84
Deschutes, Bend, Oregon			4/81	2/82
Fremont, Lakeview, Oregon			7/83	6/84
Gifford Pinchot, Vancouver, Wash.			12/82	6/83
Malheur, John Day, Oregon			12/81	6/82
Mt. Baker-Snoqualmie, Seattle, Wash.			4/82	12/82
Mt. Hood, Portland, Oregon			12/81	9/82
Ochoco, Prineville, Oregon			9/83	6/84
Okanogan, Okanogan, Wash.			12/81	9/82
Olympic, Olympia, Wash.			12/81	9/82
Rogue River, Medford, Oregon			8/82	6/83
Siskiyou, Grants Pass, Oregon			1/82	7/82
Siuslaw, Corvallis, Oregon			12/82	12/83
Umatilla, Pendleton, Oregon			6/83	12/83
Umpqua, Roseburg, Oregon			5/82	4/83
Wallowa-Whitman, Baker, Oregon			12/81	12/82
Wenatchee, Wenatchee, Wash.			4/82	12/82
Willamette, Eugene, Oregon			12/83	9/84
Winema, Klamath Falls, Oregon			12/82	6/83

	Regional Plan		Forest Plan	
	DES	FES	DES	FES
Region 8, Atlanta, Georgia	4/81	8/81		
Alabama, Montgomery, Alabama			82	83
Caribbean, Rio Piedras, Puerto Rico and the Virgin Islands			82	82
Chattahoochee-Oconee, Gainesville, Georgia			81	82
Cherokee, Cleveland, Tennessee			82	83
Daniel Boone, Winchester, Kentucky			82	83
Florida, Tallahassee, Florida			82	82
Francis Marion and Sumter, Columbia, S. Carolina			83/82	83/82
George Washington, Harrisonburg, Virginia			82	82
Jefferson, Roanoke, Virginia			82	82
Kisatchie, Pineville, Louisiana			82	83
Mississippi, Jackson, Mississippi			82	83
Nantahala/Pisgah, Asheville, N. Carolina			81	81
Ouachita, Hot Springs National Park, Arkansas			82	82
Ozark and St. Francis, Russellville, Arkansas			82	83
Texas, Lufkin, Texas			82	83
Uwharrie/Croatan, Asheville, N. Carolina			82	83

Tentative Dates
Subject to Change

	Regional Plan		Forest Plan	
	DES	FES	DES	FES
Region 9, Milwaukee, Wisconsin	3/81	9/81		
Allegheny, Warren, Pennsylvania			12/81	9/82
Chequamegon, Park Falls, Wisconsin			9/81	1/82
Chippewa, Cass Lake, Minnesota			7/82	12/82
Green Mountain, Rutland, Vermont			3/82	8/82
Hiawatha, Escanaba, Michigan			12/82	7/83
Huron-Manistee, Cadillac, Michigan			8/82	7/83
Mark Twain, Rolla, Missouri			1/82	9/82
Monongahela, Elkins, West Virginia			11/82	8/83
Nicolet, Rhinelander, Wisconsin			2/82	8/82
Ottawa, Ironwood, Michigan			12/82	10/83
Shawnee, Harrisburg, Illinois			7/81	4/82
Superior, Duluth, Minnesota			8/80	2/81
Wayne-Hoosier, Bedford, Indiana and Ohio			10/82-4/81	4/83-10/81
White Mountain, Laconia, New Hampshire and Maine			9/81	5/82

	Regional Plan		Forest Plan	
	DES	FES	DES	FES
Region 10, Juneau, Alaska	3/81	9/81		
Chugach NF, Anchorage			6/80	12/80
Tongass NF FEIS published 3/79 (Stikine Area, Chatham Area, Ketchikan Area)				

- 1/ DES is draft environmental statement.
2/ FES is final environmental statement.

APPENDIX B 3

Table B 3.1.--Summary of recreation activities on National Forest lands by Region--fiscal year 1980
(thousands of recreation visitor-days^{1/})

Region	Camping	Picnicking	Recreation travel (mechanized)	Water travel	Games and team sports	Waterskiing and other water sports	Swimming and scuba diving	Winter sports	Fishing	Hunting
01	2,666.8	481.5	3,205.2	415.8	27.2	48.6	169.1	583.8	931.0	1,234.3
02	6,377.5	1,002.6	7,024.5	272.4	53.2	17.2	66.4	4,314.1	2,007.2	1,322.0
03	5,533.9	1,488.6	7,789.8	575.9	161.7	84.7	359.8	654.7	1,185.0	1,111.7
04	7,762.0	1,496.9	5,603.2	603.8	144.7	61.1	243.6	1,890.3	2,258.3	1,604.4
05	14,406.3	1,362.4	14,291.9	1,644.4	332.9	305.0	1,913.8	3,472.1	3,230.0	1,450.5
06	8,795.0	1,074.0	6,003.8	898.4	69.8	99.5	487.4	1,969.7	1,928.2	2,159.0
08	6,018.6	1,910.8	5,670.0	1,290.8	106.4	280.4	1,307.9	10.1	3,153.4	4,003.0
09	5,461.1	622.7	5,063.7	1,437.9	58.9	97.9	582.7	838.2	2,033.5	2,666.9
10	190.1	72.1	346.0	751.0	14.1	.6	9.2	131.2	390.5	195.0
Service-wide	57,211.3	9,511.6	54,998.1	7,890.4	968.9	995.0	5,139.9	13,864.2	17,117.1	15,746.8

^{1/} One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail one person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table B 3.1.--Summary of recreation activities on National Forest lands by Region--fiscal year 1980
(thousands of recreation visitor-days)^{1/} (con.)

Region	Hiking and mountain climbing	Horseback riding	Resort use	Org. camp use	Rec. cabin use	Gathering forest products	Nature study	Viewing scenes, sports, envi- ronment	VIS (exhibits, talks, etc.)	Total Use	Percent of total
01	638.6	376.4	103.6	80.2	295.9	380.1	140.1	172.6	375.0	12,325.8	5.3
02	1,505.9	476.9	563.3	285.5	528.9	397.9	223.9	919.4	619.9	27,978.7	12.0
03	1,179.0	366.1	300.0	313.7	531.9	681.4	189.9	575.4	621.6	23,704.8	10.1
04	1,198.3	614.9	518.9	412.6	617.6	771.8	142.2	767.4	479.6	27,191.6	11.6
05	2,505.6	519.5	1,510.2	2,058.5	3,535.6	640.9	471.9	1,794.4	866.6	56,312.5	24.1
06	1,837.2	409.2	1,081.6	583.1	648.4	970.9	214.3	1,714.2	512.6	31,456.3	13.5
08	1,749.2	374.8	137.7	193.3	299.9	479.1	182.3	1,044.0	782.3	28,994.0	12.4
09	1,423.2	202.7	205.2	172.8	293.5	390.6	142.8	718.9	264.2	22,677.4	9.7
10	221.8	5.7	22.7	12.7	86.5	26.6	16.1	297.1	119.2	2,908.2	1.2
Service- wide	12,258.8	3,346.2	4,443.2	4,112.4	6,838.2	4,739.3	1,723.5	8,003.4	4,641.0	233,549.3	100.0

Table B 3.2.--Use of Forest Service Dispersed Recreation Sites by Region--fiscal year 1980
(thousands of recreation visitor-days^{1/})

Region	Roads	Trails	Lakes/ponds	Reservoirs	Rivers/streams	Oceans/ Great Lakes	General undeveloped area	Total dispersed use	Total use developed dispersed
01	2,966.8	893.5	356.8	292.3	705.0		3,555.2	8,769.6	12,325.8
02	7,014.2	1,718.4	446.9	820.9	875.9		5,349.3	16,225.6	27,978.7
03	7,682.7	1,153.2	39.1	1,186.1	635.1		4,568.5	15,264.7	23,704.8
04	5,824.2	1,524.2	593.4	1,037.9	1,307.7		6,865.2	17,152.6	27,191.6
05	14,245.9	2,473.6	774.3	3,015.1	2,344.5		10,412.3	33,265.7	56,312.5
06	6,363.3	1,783.9	881.4	547.2	1,309.1	11.8	7,291.2	18,187.9	31,456.3
08	6,121.4	1,314.4	411.2	2,814.6	2,013.9		7,713.2	20,388.7	28,994.0
09	4,971.3	1,629.6	1,841.2	539.4	1,155.6		6,195.3	16,332.4	22,677.4
10	328.3	282.6	105.6	.5	93.4	1,234.5	305.7	2,350.6	2,908.2
Service- wide	55,518.1	12,773.4	5,449.9	10,254.0	10,440.2	1,246.3	52,255.9	147,937.8	233,549.3

^{1/} One recreation visitor-day is the recreation use of National Forest lands or water that aggregates 12 visitor-hours. This may entail one person for 12 hours, 12 persons for 1 hours, or any equivalent combination of individual or group use, either continuous or intermittent.

Table B 3.3.--Use of Forest Service Developed Recreation Sites by Region--fiscal year 1980 (thousands of recreation visitor-days 1/)

Region	Obsrv. site	Play, park, sports	Boating site	Swimming site	Camp-grounds	Picnic grounds	Hotel, lodge, resorts	Organi-zation sites	Other conc. sites	Rec. res. sites	Winter sports sites	Doc. sites	Interp. sites	Total developed use	Percent of total
01	Use 16.4 % 1.2		144.4 4.8	76.3 3.9	1,806.5 4.5	219.7 3.7	116.1 2.5	108.4 2.0	10.2 1.6	295.9 4.4	577.9 4.3	7.7 7.4	176.7 10.5	3,556.2 4.2	28.9
02	Use 125.8 % 9.2	12.9 7.1	116.5 3.8	18.7 1.0	4,894.0 12.2	614.2 10.2	522.8 11.3	350.9 6.5	86.9 13.6	528.9 7.8	4,120.6 30.4	39.1 37.4	321.8 19.1	11,753.1 13.7	42.0
03	Use 123.3 % 9.0	63.2 34.6	654.9 21.5	80.1 4.1	4,394.7 10.9	998.0 16.6	251.7 5.4	413.1 7.7	114.4 17.9	531.9 7.9	618.5 4.6	15.6 14.9	180.7 10.7	8,440.1 9.9	35.6
04	Use 57.4 % 4.2	8.0 4.4	348.9 11.5	101.2 5.2	5,336.8 13.3	538.9 9.0	543.2 11.7	565.3 10.5	47.1 7.4	616.4 9.1	1,734.8 12.8	11.8 11.3	129.2 7.7	10,039.0 11.7	36.9
05	Use 69.6 % 5.1	53.7 29.4	436.8 14.4	339.0 17.4	9,436.9 23.4	870.8 14.5	1,621.0 34.9	2,621.4 48.6	234.6 36.6	3,533.5 52.2	3,571.4 26.4	.7 .7	257.4 15.3	23,046.8 26.9	40.9
06	Use 212.4 % 15.5		533.9 17.6	119.8 6.2	6,529.1 16.2	833.5 13.9	1,244.0 26.8	776.0 14.4	84.2 13.1	650.4 9.6	2,082.4 15.4	13.8 13.2	188.9 11.2	13,268.4 15.5	42.2
08	Use 581.3 % 42.3	23.4 12.8	370.0 12.2	842.6 43.3	4,361.9 10.8	1,349.1 22.4	90.4 1.9	312.4 5.8	57.5 9.0	299.9 4.4		6.8 6.5	310.0 18.4	8,605.3 10.1	29.7
09	Use 161.3 % 11.7	8.8 4.8	431.2 14.2	364.4 18.7	3,267.1 8.1	529.0 8.8	229.8 5.0	226.9 4.2	5.5 .9	292.5 4.3	742.4 5.5	9.0 8.6	77.1 4.6	6,345.0 7.4	28.0
10	Use 26.9 % 2.0	12.5 6.8	3.0 .1	1.8 .1	249.2 .6	59.3 1.0	22.8 .5	15.8 .3		22.7 .3	101.7 .8		41.9 2.5	557.6 .7	19.2
Service-wide	Use 1,374.4 % .6	182.5 .1	3,039.6 1.3	1,943.9 .8	40,276.2 17.2	6,012.5 2.6	4,641.8 2.0	5,390.2 2.3	640.4 .3	6,772.1 2.9	13,549.7 5.8	104.5	1,683.7 .7	85,611.5 36.7	

1/ One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail one person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table B 3.4.--Summary of recreation activities on National Forest lands by State--fiscal year 1980
(thousands of recreation visitor-days^{1/})

State	Camping	Picnicking	Recreation travel (mechanized)	Water travel	Games and team sports	Waterskiing and other water sports	Swimming and scuba diving	Winter sports	Fishing	Hunting
Alabama	211.5	78.5	330.5	51.1	.5	16.8	100.1		82.2	223.5
Alaska	190.1	72.1	346.0	751.0	14.1	.6	9.2	131.2	390.5	195.0
Arizona	4,130.4	949.2	6,709.1	543.6	133.6	78.9	307.9	177.6	782.5	645.2
Arkansas	505.3	161.1	385.2	108.8	13.3	29.8	187.3		322.9	490.8
California	14,845.1	1,378.2	14,540.6	1,632.8	322.7	305.3	1,846.6	3,476.3	3,380.3	1,504.1
Colorado	5,225.4	792.9	5,021.2	212.3	38.0	9.9	29.1	4,205.6	1,644.0	941.3
Florida	1,136.4	427.7	281.2	185.3	6.4	33.9	208.0		307.0	324.4
Georgia	481.6	58.0	479.6	81.5	2.9	42.4	62.8	2.6	264.0	318.8
Idaho	2,850.8	428.2	2,382.2	435.0	33.8	41.9	190.7	619.5	890.0	816.9
Illinois	138.2	54.5	152.5	27.5	2.9	5.0	26.0	.1	36.1	171.4
Indiana	180.6	25.2	105.4	82.3		25.1	29.9		122.1	102.1
Kansas	1.3	5.6	16.6	.1	.1		.1	.1	.5	1.8
Kentucky	412.9	132.8	703.9	385.1	14.0	64.1	56.3	1.0	259.9	177.4
Louisiana	107.9	28.4	78.3	10.6	2.9	4.5	20.8		46.1	94.8
Maine	8.6	2.1	3.2	.2	1.2		.1		3.3	9.3
Michigan	1,221.8	131.5	2,015.6	257.1	9.8	6.1	124.0	175.2	374.5	632.7
Minnesota	1,427.5	71.1	634.3	676.1	15.1	29.4	113.0	114.8	751.6	272.4
Mississippi	190.7	62.7	216.7	69.6	1.3	4.6	83.2		51.1	421.4
Missouri	381.4	99.5	430.6	143.7	8.6	7.6	77.7		104.0	300.5
Montana	1,775.3	313.8	2,314.0	198.9	20.0	35.0	74.9	512.7	692.6	764.0
Nebraska	23.7	24.0	18.5	1.1	1.9	.1	2.4	.2	8.4	29.3
Nevada	604.4	305.3	291.2	25.9	41.7	.2	75.1	126.5	97.1	131.8
New Hampshire	641.0	76.9	372.7	4.3	1.5	7.1	64.8	203.0	23.0	33.8
New Mexico	1,386.8	519.5	1,067.9	20.2	28.1		44.2	477.1	386.0	459.1
New York	8.6	2.7	1.0					1.1	1.3	3.9
North Carolina	895.2	304.3	1,173.0	163.7	6.5	29.3	244.0	3.6	475.3	712.5
North Dakota	12.7	7.1	20.9	1.9	.1		1.0	1.6	8.1	56.0
Ohio	44.1	30.5	93.2	9.2	2.4	.4	10.1	.3	21.8	119.0
Oklahoma	42.7	21.9	152.7	9.5	.2	.1	10.8		20.7	57.3
Oregon	5,391.2	695.4	3,531.6	702.1	37.9	89.1	397.3	837.2	1,310.0	1,237.0
Pennsylvania	511.6	46.5	370.0	98.6	1.6	6.0	33.9	.3	249.4	482.3
South Carolina	183.3	57.9	282.3	74.2	17.7	12.9	22.0		69.6	232.9
South Dakota	284.6	64.9	1,185.0	40.0	7.9	6.5	33.6	52.0	79.6	96.2
Tennessee	765.1	211.5	484.9	86.0	13.9	25.8	153.9	.3	149.1	226.8
Texas	314.6	30.2	188.1	60.8	.2	20.5	36.6		821.4	155.7
Utah	4,142.9	846.6	3,089.0	255.9	71.2	26.5	117.1	1,004.9	1,159.0	852.9
Vermont	37.5	7.3	56.0	2.5	2.2		1.7	312.1	4.4	24.8
Virginia	711.2	158.2	854.5	15.7	18.9	1.5	55.0	2.4	278.1	536.4
Washington	3,402.5	378.2	2,436.5	196.3	31.9	10.4	88.6	1,135.0	617.4	924.6
West Virginia	477.9	47.6	274.9	9.4	13.5		19.7	2.0	162.8	205.0
Wisconsin	452.6	34.9	600.9	128.0	.7	11.2	87.1	28.5	191.7	347.4
Wyoming	1,447.7	177.2	1,281.3	132.5	20.6	6.5	23.8	258.4	467.7	414.3
Puerto Rico	6.6	189.9	25.3		7.1		69.5			
Service-wide	57,211.3	9,511.6	54,998.1	7,890.4	968.9	995.0	5,139.9	13,864.2	17,117.1	15,746.8

^{1/} One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail one person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table B 3.4.--Summary of recreation activities on National Forest lands by State--fiscal year 1980
(thousands of recreation visitor-days) (con.)

State	Hiking and mountain climbing	Horseback riding	Resort use	Org. camp use	Rec. cabin use	Gathering forest products	Nature study	Viewing scenes, sports, envi- ronment	VIS (exhibits talks, etc.)	Total use	Percent of total
Alabama	58.6	15.8				37.9	16.6	3.1	25.4	1,252.1	.5
Alaska	221.8	5.7	22.7	12.7	86.5	26.6	16.1	297.1	119.2	2,908.2	1.2
Arizona	813.3	253.4	260.9	260.8	439.4	303.5	147.4	382.7	425.5	17,744.9	7.6
Arkansas	90.4	38.4	34.5	9.8	10.5	32.1	11.7	19.7	57.4	2,509.0	1.1
California	2,573.2	536.0	1,559.1	2,058.5	3,571.7	666.2	479.3	1,997.2	859.9	57,533.1	24.6
Colorado	1,264.7	372.0	330.2	198.7	284.9	306.3	172.3	847.9	551.1	22,448.7	9.6
Florida	46.8	29.0		51.4	121.8	29.7	20.9	30.7	33.3	3,273.9	1.4
Georgia	196.2	21.4		16.2	28.5	8.8	13.7	93.1	24.3	2,196.4	.9
Idaho	399.7	230.5	180.5	132.3	294.4	396.2	80.3	175.2	219.2	10,797.3	4.6
Illinois	52.5	49.6				6.5	5.5	72.2	38.8	839.3	.4
Indiana	40.2	41.5				10.9	7.7	1.4	7.0	781.4	.3
Kansas	.4	.2				.3	.8			27.9	
Kentucky	262.7	38.9	11.6	11.1	11.2	20.4	12.9	111.9	190.7	2,878.8	1.2
Louisiana	43.9	6.4	5.7	13.9	23.3	15.3	3.0	4.4	13.5	523.7	.2
Maine	8.1			1.3		.1	2.7	.2	.5	40.9	
Michigan	115.1	38.0	3.4	12.3	77.2	132.4	31.3	81.6	47.2	5,486.8	2.3
Minnesota	90.3	6.4	85.1	26.3	152.1	55.5	17.0	11.1	50.3	4,599.4	2.0
Mississippi	40.6	20.9				15.0	7.8	5.6	12.1	1,203.3	.5
Missouri	68.5	33.7		23.4		41.2	14.3	35.8	23.8	1,794.3	.8
Montana	472.9	280.7	63.5	79.2	240.1	272.8	89.1	133.4	244.3	8,577.2	3.7
Nebraska	11.7	4.9		8.4		11.6	8.8	.4	8.9	164.3	.1
Nevada	102.0	63.9	34.9	55.4	22.3	56.8	27.5	54.3	248.0	2,364.3	1.0
New Hampshire	803.2	.8	77.6	44.0		5.2	19.8	348.3	25.5	2,752.5	1.2
New Mexico	364.7	112.4	30.5	52.9	92.5	377.9	40.7	192.5	190.1	5,843.1	2.5
New York	1.8	1.2				.9	1.1			23.6	
North Carolina	500.0	72.6	6.7		5.1	139.0	26.9	380.5	114.6	5,252.8	2.2
North Dakota	2.1	2.8				2.2	.9	7.5	1.9	126.8	.1
Ohio	21.1	13.9				11.2	5.4	2.7	7.9	393.2	.2
Oklahoma	15.1	4.4				5.3	2.3	32.7	13.4	389.1	.2
Oregon	832.2	209.0	774.0	293.0	392.1	607.7	115.2	777.6	297.8	18,527.4	7.9
Pennsylvania	80.5	5.6	1.3	18.7	52.1	27.7	7.0	135.7	15.8	2,145.6	.9
South Carolina	35.4	23.9				31.3	14.0	19.8	23.7	1,110.9	.5
South Dakota	57.6	33.4	19.2	26.4	93.5	36.7	16.7	39.6	31.5	2,204.9	.9
Tennessee	155.3	26.5	33.0	31.0	93.9	19.1	10.9	54.2	29.3	2,570.5	1.1
Texas	21.2	5.3	20.1			3.5	7.4	39.1	12.7	1,737.4	.7
Utah	639.7	308.5	261.4	178.4	275.4	367.4	67.6	283.8	112.8	14,061.0	6.0
Vermont	24.8	1.5	35.1	9.9	.5	2.3	1.0	19.5	1.9	545.0	.2
Virginia	212.8	68.8	.9	24.0	.6	113.2	31.4	209.5	34.9	3,328.0	1.4
Washington	1,004.6	196.6	307.6	290.1	256.3	365.4	99.0	935.6	215.0	12,891.6	5.5
West Virginia	82.4	4.9		35.4	1.7	14.5	16.0	8.1	24.7	1,400.5	.6
Wisconsin	37.8	8.4	2.7	1.5	10.6	87.9	14.5	5.7	21.6	2,073.7	.9
Wyoming	324.8	157.5	247.2	99.5	195.7	72.0	34.9	115.5	63.3	5,540.4	2.4
Puerto Rico	68.1		33.8	35.9	4.3	2.8	4.1	36.5	202.2	686.1	.3
Service-wide	12,258.8	3,346.2	4,443.2	4,112.4	6,838.2	4,739.3	1,723.5	8,003.4	4,641.0	233,549.3	100.0

Table B 3.5.--Use of Forest Service Developed Recreation Sites by State--fiscal year 1980 (thousands of recreation visitor-days^{1/})

State	Observ. site	Play park, sports	Boating site	Swimming site	Camp-grounds	Picnic grounds	Hotel, lodge, resorts	Organi- zation sites	Other conc. sites	Rec. res. sites	Winter sports sites	Doc. sites	Interp. sites	Total developed use	Percent of total
Alabama	26.9	12.5	6.3	86.2	186.4	13.8	22.8	15.8		22.7	101.7		5.4	298.1	.3
Alaska	57.7	63.2	3.0	1.8	249.2	59.3	220.7	345.4	87.7	439.4	118.1	3.4	41.9	557.6	.7
Arizona	17.2		572.7	80.1	3,237.0	601.7	220.7	11.3		10.5			73.5	5,900.6	6.9
Arkansas	71.7		3.0	111.7	372.9	86.1	34.5	2,621.4		241.8	3,569.6		32.4	679.6	.8
California	82.4	53.7	436.8	339.0	9,760.4	881.7	1,625.6	2,621.4	241.8	3,569.6	3,571.4	.7	257.4	23,431.2	27.4
Colorado		10.6	77.9		4,004.1	466.8	290.1	241.2	61.3	284.9	4,045.7	38.1	301.0	9,904.1	11.6
Florida			42.0	163.4	857.4	282.3		93.4		121.8		3.2	15.0	1,578.5	1.8
Georgia	23.5		22.1	23.2	241.0	35.5		28.8		28.5			12.7	415.3	.5
Idaho	10.1	.7	172.4	54.9	1,906.1	173.9	173.7	169.8	12.6	289.4	548.8	17.6	133.7	3,663.7	4.3
Illinois	27.8		13.3	16.3	98.7	46.9						.2	3.8	207.0	.2
Indiana	.1		24.2	24.4	128.3	21.4							5.0	203.4	.2
Kansas						5.4								5.4	
Kentucky	163.3	1.9	112.9	17.4	377.1	111.0		14.5		11.2		.4	3.8	813.5	1.0
Louisiana	1.7		5.6	29.6	86.9	13.3		17.3		23.3			5.8	183.5	.2
Maine	.4				6.9	1.6		1.5					.4	10.8	
Michigan	22.5	6.1	135.8	100.0	809.9	134.1	2.6	15.0	.9	77.2	131.5	2.7	18.9	1,457.2	1.7
Minnesota	2.9		146.3	56.2	549.0	50.0	123.5	35.1	3.4	152.1	53.5	.8	.7	1,173.5	1.4
Mississippi			25.1	88.1	109.1	34.1							2.4	258.8	.3
Missouri	2.2		20.4	6.9	249.2	113.9		29.2				.8	3.2	425.8	.5
Montana	12.3		116.4	35.9	1,259.4	133.4	83.9	106.4	2.4	240.1	520.0	1.5	104.4	2,616.1	3.1
Nebraska	.2			1.8	14.9	18.8		12.8				.1		48.6	.1
Nevada	3.0	1.8			544.5	129.6	111.3	102.8		24.1	80.5	.1	22.6	1,020.2	1.2
New Hampshire	55.0		5.4	27.5	362.7	64.4	82.3	44.8			212.7		23.8	878.6	1.0
New Mexico	65.6		68.0		1,154.4	365.9	21.0	67.7	26.7	92.5	500.4	12.2	107.2	2,481.6	2.9
New York					6.9	2.5								9.4	
North Carolina	259.0		95.4	141.8	673.1	219.2	16.2			5.1		1.6	64.3	1,475.7	1.7
North Dakota					12.9	.8							.3	14.0	
Ohio			1.8	7.0	29.0	19.4							.7	57.9	.1
Oklahoma	16.3		4.8	8.9	25.8	15.2							4.6	75.6	.1
Oregon	156.2		458.5	99.0	4,365.0	717.4	838.3	399.7	80.5	394.1	790.8	13.4	143.3	8,456.2	9.9
Pennsylvania	44.1	.2	26.8	52.1	384.6	16.4		28.6		52.1		.4	5.7	610.6	.7
South Carolina		13.4	14.5	13.9	138.2	62.5		2.6			36.1		1.1	246.6	.3
South Dakota	28.1	2.3	24.1	16.9	297.5	42.6	4.3	34.3	21.7	93.5			4.0	605.4	.7
Tennessee	15.9	4.7	19.3	86.1	645.2	200.4	37.3	44.0	3.1	93.9		.4	15.9	1,166.2	1.4
Texas	.3		26.8	23.2	187.6	36.5	12.4		19.6				4.0	310.4	.4
Utah	44.1	5.5	140.5	78.6	2,724.4	307.5	251.6	218.8	34.2	277.4	927.8	.4	34.3	5,045.1	5.9
Vermont	2.0	2.5		.3	26.8	7.1	17.4	11.0		.5	332.7		.8	401.1	.5
Virginia	27.8	3.4	6.0	43.2	421.2	125.7		30.2	1.0	.6		.8	27.6	687.5	.8
Washington	54.1		75.4	20.8	2,165.1	116.1	405.7	376.3	3.7	256.3	1,291.6	.4	45.6	4,811.1	5.6
West Virginia	4.3		6.0	17.3	262.8	1.5	1.5	61.1		.7		4.5	6.8	402.2	.5
Wisconsin			51.6	62.3	395.6	20.8	2.5	1.1	1.2	10.6	12.0	.9	7.5	565.2	.7
Wyoming	19.4		78.5	8.1	949.0	83.1	262.6	138.5	4.8	195.7	274.4		27.4	2,042.4	2.4
Puerto Rico	56.3					137.2		69.8	33.8	4.3			114.8	416.2	.5
Service-wide	1,374.4	182.5	3,039.6	1,943.9	40,276.2	6,012.5	4,641.8	5,390.2	640.4	6,772.1	13,549.7	104.5	1,683.7	85,611.5	100.0

^{1/} One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail one person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

Table B 3.6.--Use of Forest Service Dispersed Recreation Sites by State--fiscal year 1980 (thousands of recreation visitor-days^{1/})

State	Roads	Trails	Lakes/ponds	Reservoirs	Rivers/streams	Oceans/ Great Lakes	General undeveloped area	Total dispersed use	Total use developed dispersed
Alabama	359.3	41.4	4.4	105.0	79.0		364.9	954.0	1,252.1
Alaska	328.3	282.6	105.6	.5	93.4		305.7	2,350.6	2,908.2
Arizona	6,619.6	886.7	8.1	1,049.4	432.6	1,234.5	2,847.9	11,844.3	17,744.9
Arkansas	409.1	40.3		410.5	151.6		817.9	1,829.4	2,509.0
California	14,678.7	2,575.2	804.7	3,055.1	2,445.5		10,542.7	34,101.9	57,533.1
Colorado	5,093.0	1,521.8	388.8	650.5	670.0		4,220.5	12,544.6	22,448.7
Florida	319.0	14.0	389.7	13.5	170.2		789.0	1,695.4	3,273.9
Georgia	510.2	152.5		193.7	226.6		698.1	1,781.1	2,196.4
Idaho	2,180.2	645.7	294.8	309.5	798.1		2,905.3	7,133.6	10,797.3
Illinois	92.7	84.3	.6	58.0	17.3		379.4	632.3	839.3
Indiana	130.8	32.4		194.3	22.5		198.0	578.0	781.4
Kansas	16.7			1.1			4.7	22.5	27.9
Kentucky	802.9	188.9		459.8	210.8		402.9	2,065.3	2,878.8
Louisiana	82.1	38.7		39.4	27.5		152.5	340.2	523.7
Maine	2.4	8.6	1.4	.9	2.5		14.3	30.1	40.9
Michigan	1,837.0	198.1	334.8	21.4	273.1		1,365.2	4,029.6	5,486.8
Minnesota	542.4	172.7	1,246.9	2.1	197.8		1,264.0	3,425.9	4,599.4
Mississippi	238.5	18.5	5.9	56.9	79.0		545.7	944.5	1,203.3
Missouri	462.5	50.3	.2	56.3	223.2		576.0	1,368.5	1,794.3
Montana	2,123.4	662.7	272.9	208.7	381.1		2,312.3	5,961.1	8,577.2
Nebraska	24.8	10.1		9.7	.6		70.5	115.7	164.3
Nevada	491.0	116.0	16.5	3.0	83.7		633.9	1,344.1	2,364.3
New Hampshire	526.4	839.7	9.6	3.5	48.0		446.7	1,873.9	2,752.5
New Mexico	1,047.3	266.5	31.0	107.2	202.5		1,707.0	3,361.5	5,843.1
New York	.7	4.8		1.4			7.3	14.2	23.6
North Carolina	1,197.5	350.4	9.9	346.6	404.1		1,468.6	3,777.1	5,252.8
North Dakota	24.6			8.1	5.4		74.7	112.8	126.8
Ohio	81.4	17.4		18.7	19.9		197.9	335.3	393.2
Oklahoma	174.6	8.8		23.1	12.4		94.6	313.5	389.1
Oregon	3,469.1	727.4	561.5	475.7	880.1		3,957.4	10,071.2	18,527.4
Pennsylvania	434.4	58.2		142.0	117.5		782.9	1,535.0	2,145.6
South Carolina	287.5	32.3	.3	62.3	124.9		357.0	864.3	1,110.9
South Dakota	1,154.8	25.5		104.2	32.3		282.7	1,599.5	2,204.9
Tennessee	469.5	144.0		122.0	187.0		481.8	1,404.3	2,570.5
Texas	198.6	13.6	.3	892.3	20.7		301.5	1,427.0	1,737.4
Utah	3,144.1	684.8	255.8	700.3	508.2		3,722.7	9,015.9	14,061.0
Vermont	65.6	21.9	2.4	1.0	5.3		47.7	143.9	545.0
Virginia	970.4	218.1		108.4	195.6		1,148.0	2,640.5	3,328.0
Washington	2,851.9	1,056.8	317.0	71.5	426.3	11.8	3,345.2	8,080.5	12,891.6
West Virginia	300.2	60.1	.7	33.0	140.7		463.6	998.3	1,400.5
Wisconsin	545.3	84.4	245.3	17.4	89.9		526.2	1,508.5	2,073.7
Wyoming	1,162.1	367.6	140.8	116.0	310.9		1,400.6	3,498.0	5,540.4
Puerto Rico	67.5	49.6			122.4		30.4	269.9	686.1
Service-wide	55,518.1	12,773.4	5,449.9	10,254.0	10,440.2	1,246.3	52,255.9	147,937.8	233,549.3

^{1/} One recreation visitor-day is the recreation use of National Forest land or water that aggregates 12 visitor-hours. This may entail one person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

APPENDIX B 4

The status of the National Forest units of the National Wilderness Preservation System is required annually by the Secretary of Agriculture. The Sixteenth Annual Report (as of December 31, 1979) details the wilderness management situation.

Table B 4.1.--Additions to the National Wilderness Preservation System in fiscal year 1980

Area	P.L. No.	Forest	State	Date	Acres
River of No Return	96-312	Bitterroot, Boise, Challis, Nezperce, Payette, Salmon	Idaho	7/23/80	2,239,000
Selway- Bitterroot Addition	96-312	Bitterroot, Nezperce	Idaho	7/23/80	<u>105,600</u>
					2,344,600

Table B 4.2.--Addition to the National Wild and Scenic Rivers System in fiscal year 1980

River	P.L. No.	Forest	State	Date	Miles
Salmon	96-312	Bitterroot, Boise, Payette, Salmon	Idaho	7/23/80	125

APPENDIX B 5

Wildlife and Fisheries Management

Wildlife and fish habitat improvements in fiscal year 1980 follow in tables B 5.1 and B 5.2.

Table B 5.1.--Wildlife and fisheries habitat improvement by funding
(thousands of acres)

Region	Funded target	^{1/} K-V	^{2/} WL/F	Total
1	17.82	2.10	19.76	21.86
2	113.58	1.88	111.54	113.42
3	42.74	12.08	39.06	51.14
4	30.27	6.76	41.52	48.28
5	50.85	14.32	56.98	71.30
6	27.64	14.50	13.28	27.78
8	243.97	44.00	217.60	261.60
9	39.19	2.48	41.76	44.24
10	1.46	0.78	0.70	1.48
Total	567.52	98.90	542.20	641.10

1/ Knutson-Vandenberg Act funds.

2/ Appropriated funds.

Table B 5.2.--Wildlife and fish habitat improvements by Region--fiscal year 1980 (thousands of acres)

(Accomplishments by element. Unit of measure M acres)										
Regions										
	1	2	3	4	5	6	8	9	10	Total
<u>Wildlife Habitat Improvement</u>										
Big Game	11.82	67.52	40.28	44.78	52.60	18.18	128.80	18.70	0.56	383.24
Waterfowl	0.28	0.20	0.04	0.04	0.58	1.30	3.60	1.70	-	7.74
Other	2.14	6.94	7.00	0.08	4.00	6.50	88.40	8.80	0.02	153.88
Subtotal	14.24	104.66	47.32	44.90	57.18	25.98	220.80	29.20	0.58	544.86
<u>Fish Habitat Improvement</u>										
Anadromous	0.50	-	-	0.20	0.80	1.40	-	1.10	0.80	4.80
Cold Water	1.80	2.10	0.20	1.20	0.40	0.40	0.60	7.50	0.10	14.30
Warm Water	-	-	-	-	-	-	2.00	2.10	-	4.10
Subtotal	2.30	2.10	0.20	1.40	1.20	1.80	2.60	10.70	0.90	23.20
<u>Threatened and Endangered Species Habitat Improvement</u>										
Wildlife	5.32	6.66	3.62	1.96	12.84	0.008	38.20	3.68	-	72.28
Fish	-	-	0.0004	0.02	0.06	-	-	0.66	-	0.74
Plants	-	-	-	-	0.02	-	-	-	-	0.02
Subtotal	5.32	6.66	3.62	1.98	12.92	-	38.20	4.34	-	73.094
Total	21.86	113.42	51.14	48.28	71.30	27.78	261.60	44.24	1.48	641.10

APPENDIX B 6

Table B 6.1.--Range allotment management--fiscal year 1980

Region	Total allotments	Allotments maintained to improved management status	Allotments on which was started
1	2,163	1,071	92
2	2,680	2,849	663
3	1,493	957	128
4	2,045	1,079	105
5	832	591	84
6	862	414	70
8	502	323	58
9	177	94	36
10	-	-	-
Total	10,754	7,378	1,236

Table B 6.2.--Actual grazing use--fiscal year 1980 (animal unit months)

States	Cattle	Domestic horses	Sheep	Wild horses	Wild burros	Total
Alabama	4,588					4,588
Alaska						
Arizona	1,222,988	13,692	22,853	72	115	1,259,720
Arkansas	40,603	200				40,803
California	364,064	11,245	41,204	8,294	708	425,515
Colorado	811,772	23,032	166,040			1,000,844
Florida	16,761	26				16,787
Georgia	6,040	1				6,041
Idaho	595,832	44,229	213,236	76	8	853,381
Illinois	9,088	58	756			9,902
Indiana	373					373
Kansas	64,759	119				64,878
Kentucky						
Louisiana	39,357	1,376				40,733
Maine						
Michigan	259					259
Minnesota	2,197					2,197
Mississippi	9,597					9,597
Missouri	29,645	270				29,915
Montana	583,773	13,772	21,157	29		618,731
Nebraska	126,058	24	294			126,376
Nevada	227,262	635	40,018	4,112		272,027
New Hampshire						
New Mexico	765,058	9,089	32,502	1,727	307	808,683
New York	6,930					6,930
North Carolina	15					15
North Dakota	516,806	3,499	349			520,654
Ohio	908					908
Oklahoma	23,344	7				23,351
Oregon	495,020	1,000	29,239	1,440		526,699
Pennsylvania						
South Carolina	589					589
South Dakota	450,273	1,147	6,340			457,760
Tennessee						
Texas	64,207	62				64,269
Utah	450,043	6,092	189,587	942		646,664
Vermont	307		5			312
Virginia	4,378	999	188			5,565
Washington	105,519	3,510	6,287			115,316
West Virginia	8,537	70	270			8,877
Wisconsin	367	2				369
Wyoming	547,049	23,282	122,430	384		693,145
Total	7,594,366	157,438	892,755	17,076	1,138	8,662,773

Table B 6.3.--U.S. Dept. of Agriculture - Forest Service annual grazing statistical report--fiscal year 1980

	Number of permittees ^{1/}	Cattle		Horses and burros		Sheep and goats		Total
		Number	AUM's	Number	AUM's	Number	AUM's	
Authorized to graze		1,757,740	8,447,829	189,164	138,041	2,125,847	1,267,254	9,853,124
Actually grazed								
Paid permits	15,951	1,282,610	7,557,385	28,432	83,651	1,245,493	881,506	8,522,542
Free use								
Recreation stock	85,602	15	185	156,068	64,109			64,294
Other free use	1,541	2,278	15,961	4,854	7,354	3,662	4,770	28,085
Non-NFS lands	227	56,954	485,119	267	5,079	29,477	25,637	515,835
Crossing	87	35,663	3,559	212	38	63,185	4,319	7,916
Unauthorized use	222	5,414	17,276	379	2,286	5,862	2,160	21,722
Subtotal ^{2/}	103,403	1,325,980	7,594,366	189,945	157,438	1,318,202	892,755	8,644,559
Wild horses				1,963	17,076			17,076
Wild burros				188	1,138			1,138
Total act. grazed ^{2/}	103,403	1,325,980	7,594,366	192,096	175,652	1,318,202	892,755	8,662,773
Losses								
Poisonous plants		2,236		6		8,684		10,926
Predators		611		20		17,644		18,275
Other		729,414		289,576		12,754		1,031,744

^{1/}Permittees holding paid permits are not counted in other categories.

^{2/}Non-NFS land data not included in totals.

Table B 6.4.--Range improvements--fiscal year 1980

Improvement type	Units of measure	Units of construction completed	Total cost
Range fence	(miles)	3,377.0	5,097,587
Spring	(sites)	1,198.3	856,470
Well	(sites)	99.1	382,798
Dam and reservoir	(sites)	1,648.1	498,319
Pit tank	(sites)	194.2	106,380
Trick tank	(sites)	64.1	402,433
Pump	(sites)	14.0	36,881
Pipeline	(miles)	451.1	1,202,981
Water storage tank	(sites)	163.9	356,000
Cattleguard	(sites)	375.7	722,069
Corral	(sites)	57.3	138,892
Dipping vat	(sites)	0	0
Trails and underpasses	(sites)	26.8	32,682
Loading	(sites)	6.0	<u>1,976</u>
Total structural			<u>9,516,466</u>
Cover manipulation tall brush	(acres)	39,232.0	883,153
Cover manipulation low brush	(acres)	58,671.5	529,192
Range plant control	(acres)	9,306.0	326,431
Forage improvement	(acres)	140,372.4	1,276,961
Noxious farm weeds control	(acres)	30,127.9	848,923
Total nonstructural			<u>3,864,660</u>
Total all improvements			<u>13,700,128</u>

APPENDIX B 7

Table B 7.1.--Timber sales in fiscal year 1980, sorted into five general groups

Group	Sale preparation and development costs	Immediate (short-range) returns to Government
One	Low to moderate	Moderate to high
Two	High	Moderate to high
Three	Low to high	Lower than costs
Four	Low to moderate	Moderate and greater than costs
Five	Low to high	Usually minimum and greater than costs

-Table B 7.2.--Data for timber sales representative of each of the five groups

	One	Two	GROUPS Three	Four	Five
Region	8	6	2	3	10
National Forest	Alabama	Olympic	Rio Grande	Tonto	Tongass
Sale Name	Compartment 141	Hornet Heights	Thunder	RIM	Gilbert Bay
Volume Sold (MBF)	2,966	7,700	9,700	4,100	30,910
<u>Government Costs (M\$)</u>					
Timber Management	33	64	75	31	446
Transportation	58	140	344	47	556
Other Resources	13	18	1	4	236
Total	104	222	420	82	1,238
<u>Returns to Government (M\$)</u>					
Stumpage Receipts (including stand improvement)	228	1,870	25	598	1,657
Value of Constructed Road Access	47	536	359	66	2,297
Total	275	2,406	384	634	3,954
<u>Averages per thousands</u>					
board feet	35.06	28.83	43.30	20.00	40.05
Expenditures					
Returns	92.72	312.44	39.62	154.63	27.92
Returns/Expen. ratio	2.64	10.82	0.92	7.73	3.19

Table B 7.3.--Timber sold and harvested on National Forest System lands--
fiscal year 1980

State or Commonwealth	Timber sold			Timber harvested	
	Sales number	Volume Thousand board feet	Value dollars	Volume Thousand board feet	Value dollars
Alabama	529	75,314	3,591,113	76,744	4,685,736
Alaska	120	189,267	19,969,091	451,140	7,186,121
Arizona	11,539	196,100	14,219,611	263,137	11,510,268
Arkansas	886	195,918	15,106,057	235,803	13,717,227
California	18,038	2,049,533	468,678,258	1,461,090	120,809,743
Colorado	1,706	131,317	907,114	111,135	1,092,202
Florida	128	104,360	5,448,279	110,791	4,417,695
Georgia	932	89,508	2,439,870	96,571	2,381,808
Idaho	9,681	829,245	34,163,249	637,967	24,772,147
Illinois	42	14,697	361,858	7,104	127,147
Indiana	51	7,228	285,562	5,626	265,157
Kentucky	107	19,006	439,535	19,710	339,764
Louisiana	330	149,940	18,349,388	144,328	10,644,959
Maine	13	6,905	70,609	2,067	39,236
Michigan	1,006	161,597	2,996,833	169,427	2,416,829
Minnesota	278	138,485	2,818,389	113,262	964,927
Mississippi	707	246,541	20,420,623	307,245	19,850,412
Missouri	731	52,597	1,879,530	53,095	2,026,115
Montana	2,986	558,648	23,987,410	420,487	15,413,515
Nebraska	3	13	1,160	13	1,160
Nevada	337	691	3,678	515	3,661
New Hampshire	225	28,679	412,507	23,942	490,009
New Mexico	16,368	134,508	2,251,772	102,257	4,728,953
New York	67	224	17,131	77	549
North Carolina	3,754	66,266	1,440,409	51,946	1,041,864
Ohio	82	8,825	231,520	11,264	287,011
Oklahoma	110	38,429	2,496,248	25,889	1,346,548
Oregon	8,537	3,714,569	1,037,315,500	2,511,401	348,131,671
Pennsylvania	145	41,671	4,549,311	45,021	2,687,842
South Carolina	293	118,848	9,289,584	98,531	5,975,833
South Dakota	122	98,310	792,196	82,119	1,171,374
Tennessee	154	32,439	552,826	28,585	597,873
Texas	427	101,329	16,615,405	63,507	5,723,398
Utah	2,244	55,509	473,455	44,663	1,606,029
Vermont	131	16,611	515,860	10,929	330,321
Virginia	645	51,341	474,802	37,921	396,600
Washington	3,435	1,433,983	252,121,068	1,121,058	109,093,837
West Virginia	373	19,234	330,328	14,023	527,970
Wisconsin	408	113,177	2,070,321	109,643	1,519,280
Wyoming	1,667	107,994	578,417	77,819	1,906,422
Puerto Rico	0	0	0	0	0
Total	89,337	11,398,856	1,968,665,871	9,147,051	730,229,213

Table B 7.4.--Comparison on 1975 RPA projections with actual levels
for key economic indicators

Item	Unit	RPA projected 1980 level	Actual 1980 level	Highest level in previous 5 years
Population	(millions)	223.0	226.0	226.0 (1980)
Gross National Product 1972 dollars	(billions)	1,650.0	1,425.0	1,432.0 (1979)
Housing starts	(millions)	2.0	1.2	2.0 (1978)
Total roundwood consumption	(billion cu. ft.)	16.6	13.0	14.8 (1978)

APPENDIX B 8

Table B 8.1.--Reforestation program needs for fiscal years 1980 through 1985
(acres in thousands and dollars in millions)

	Backlog (Acres)	Current or anticipated (Acres)	Total (Acres)	Annual program appropriated funds (Acres) (Dollars)	
10/1/79 bal.	882	757	1,639		
Fiscal year 1980					
new needs	-	+ 365	+ 365 ^{1/}		
adjustments	- 212	- 8	- 220 ^{2/}		
accomplishments	- 95	- 339	- 434	229	54.8 ^{3/}
10/1/80 bal.	575	775	1,350		
Fiscal year 1981					
new needs	-	+ 420	+ 420		
accomplishments	- 98	- 372	- 470	195	58.0 ^{4/}
10/1/81 bal.	477	823	1,300		
Fiscal year 1982					
new needs	-	+ 400	+ 400		
accomplishments	- 96	- 381	- 477	215 ^{5/}	75.4 ^{5/6/}
10/1/82 bal.	381	842	1,223		
Fiscal year 1983					
new needs	-	+ 400	+ 400		
accomplishments	- 86	- 394	- 480	220	77.2 ^{6/}
10/1/83 bal.	295	848	1,143		
Fiscal year 1984					
new needs	-	+ 400	+ 400		
accomplishments	- 74	- 402	- 476	206	72.3 ^{6/}
10/1/84 bal.	221	846	1,067		
Fiscal year 1985					
new needs	-	+ 400	+ 400		
accomplishments	- 18	- 449	- 467	203	71.3 ^{6/}
10/1/85 bal.	203	797	1,000		

^{1/} New needs are the results of timber harvests, regeneration failures, and natural disasters such as fires, storms, insects and diseases.

^{2/} The adjustments include 117,000 acres regenerated through natural stocking and 103,000 acres reduction by management decision (land classification, multiple use, and land use decisions).

^{3/} Acreage cost of \$239 per acre.

^{4/} Average cost of \$297 per acre.

^{5/} Includes the Tongass NF acres but not dollars; dollars are not appropriated funds.

^{6/} Average cost of \$351 per acre.

Table B 8.2--Reforestation needs in Acres as of October 1, 1980, by State, Forest and site productivity class

State	National Forest	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+	
Alabama	Alabama					
	Chugach	18	1,721	3,442	374	5,537
	Tongass-Chatham		292			310
	Tongass-Ketchikan			2,803	8,408	11,211
Alaska	Tongass-Stikine				14,012	14,012
					19,918	19,918
Arizona	Total	18	292	2,803	42,338	45,451
	Apache-Sitgreaves					
	Coconino	1,551	17,906	150		19,607
	Coronado	10,030	11,216			21,246
	Kaibab	-				-
	Prescott	1,015	6,617			7,632
	Tonto	236	534			770
		87	417			504
Arkansas	Total	12,919	36,690	150		49,759
	Ouachita					
	Ozark and St. Francis		28,284	5,377		33,661
			5,169	1,275		6,444
California	Total		33,453	6,652		40,105
	Angeles		297			297
	Cleveland	535	50			585
	Eldorado		150	714	265	1,129
	Inyo	112	194			306
	Klamath	8,919	9,799	2,979	559	22,256
	Lassen		604	281		885
	Los Padres	296	149	20		465
	Mendocino	98	1,285	663	275	2,321
	Modoc	4,246	8,182	1,931	578	14,937
	Plumas	85	4,821	2,766	204	7,876
	Rogue River			4,504		4,504
	San Bernardino	155	300	157		612
	Sequoia	57	3,254	2,509	3	5,823
	Shasta-Trinity	2,212	28,334	18,734	9,960	59,240
	Sierra	456	2,244	1,556	1,202	5,458
	Siskiyou			1,415		1,415
	Six Rivers		175	2,551	4,212	6,938
	Stanislaus		508	4,935	2,410	7,853
	Tahoe	3,242	3,461	3,580	2,123	12,406
	Toiyabe	1,227				1,227
	Total	21,640	63,807	49,295	21,791	156,533

Table B 8.2--Reforestation needs in acres as of October 1, 1980, by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+	
Colorado	Arapaho and Roosevelt		7,326			7,326
	Grand Mesa, Uncompahgre and Gunnison	3,183	1,415	293		4,891
	Manti-LaSal		500			500
	Pike and San Isabel	110	695	740		1,545
	Rio Grande	1,845	791			2,636
	Routt	1,205				1,205
	San Juan	15,516	15,516			31,032
Florida	White River		2,094	1,050		3,144
	Total	21,859	28,337	2,083		52,279
	Total	3,734	13,994	6,134	827	24,689
Georgia	Chattahoochee and Oconee	166	3,728	3,737	94	7,725
	Boise	5,161	25,793	3,179	336	34,469
	Caribou		800			800
	Challis	310	154			464
	Clearwater	60,877	11,224	8,992	30,391	111,484
	Idaho Panhandle	25,553	2,481	21,927	32,523	82,484
	Kootenai	1,404	62	178	813	2,457
	Nezperce	34,879	1,580	1,054	2,967	40,480
	Payette	148	2,973	2,569		5,690
	Salmon	4,999	3,667	8		8,674
Idaho	Sawtooth	50	3,097	64		3,211
	Targhee	10,080	2,659			12,739
	Total	143,461	54,490	37,971	67,030	302,952
	Total	45	536	287	105	973
	Total		422	205	90	717
	Total	110	3,475	2,217	317	6,119
	Total		1,294	4,859	6,877	13,030
	Total		40	45	15	100
	Total					
	Total					
Illinois	Shawnee					
	Wayne-Hoosier					
	Daniel Boone					
	Kisatchie					
	White Mountain					

Table B 8.2--Reforestation needs in acres as of October 1, 1980, by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+	
Michigan	Hiawatha	1,917	1,411	269	34	3,631
	Huron-Manistee	5,350	2,685	231		8,266
	Ottawa		2,560	940		3,500
Minnesota	Total	7,267	6,656	1,440	34	15,397
	Chippewa	170	110			280
	Superior	100	2,750	11,504	377	14,731
Mississippi	Total	270	2,860	11,504	377	15,011
	Total	73	723	6,765	4,844	12,405
	Total	3,416	3,787	294		7,497
Missouri	Mark Twain	1,934	3,253	162		5,349
	Beaverhead	8,511	3,542	2,367		14,420
	Bitterroot					603
Montana	Custer	580	23			
	Deerlodge	5,022	2,340	2,518	260	10,140
	Flathead	5,583	479	2,619	5,780	14,461
	Gallatin	4,711	530	585	413	6,239
	Helena	5,776	2,147	2,283		10,206
	Idaho Panhandle			52	91	143
	Kootenai	35,888	6,035	11,571	9,612	63,106
	Lewis and Clark	3,495	3,612	1,104		8,211
	Lolo	11,983	4,724	6,442	383	23,532
Nebraska	Total	83,483	26,685	29,703	16,539	156,410
	Total	-	-	-	-	-
	Nebraska	-	-	-	-	-
Nevada	Humboldt	-	-	-	-	-
	Toiyabe	-	-	-	-	-
	Total	-	-	-	-	-
New Hampshire	White Mountain		350	430	90	870
	Carson	2,747	4,719			7,466
	Cibola		15,895			15,895
New Mexico	Gila	571	6,856			7,427
	Lincoln	814	4,371			5,185
	Santa Fe		10,426			10,426
	Total	4,132	42,267			46,399

Table B 8.2--Reforestation needs in acres as of October 1, 1980, by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+	
North Carolina Ohio Oklahoma Oregon	North Carolina	168	1,323	2,026	3,479	6,996
	Wayne		175	480	221	876
	Ouachita		3,739	107	589	4,435
	Deschutes	11,428	13,369	4,678		29,475
	Fremont	3,583	9,787	1,296		14,666
	Malheur	2,186	4,396	32		6,614
	Mt. Hood	120	4,799	14,696	3,180	22,795
	Ochoco	882	677	249		1,798
	Rogue River		1,840	24,810	719	27,369
	Siskiyou	164	6,856	16,352	8,885	32,257
Pennsylvania Puerto Rico South Carolina South Dakota Tennessee Texas Utah	Siuslaw				9,956	9,956
	Umatilla	591	10,081	800		11,472
	Umpqua	56	1,580	8,875	3,282	13,793
	Wallowa-Whitman	1,957	4,798			8,064
	Willamette	10	2,327	15,625	13,381	31,343
	Winema	10,704	4,920	2,060	998	18,682
		31,681	65,420	90,782	40,401	228,284
	Allegheny		1,112	3,325	1,112	5,549
	Caribbean			300		300
	South Carolina		1,560	1,645	1,470	4,675
Vermont Virginia	Black Hills	-	-	-	-	-
	Cherokee		95	182	345	622
	Texas		1,927	3,600		5,527
	Ashley	2,212	434			2,646
	Dixie		2,231			2,231
	Fishlake	903				903
	Manti-LaSal		278			278
	Sawtooth					-
	Uinta		13	227	-	240
	Wasatch	619	655	169	-	1,443
		3,734	3,611	396		7,741
		4,110	441	342		4,893
		669	540	77	69	1,355
		163	810	1,055	192	2,220
Total		832	1,350	1,132	261	3,575

Table B 8.2--Reforestation needs in acres as of October 1, 1980, by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+	
Washington	Colville	112	6,838	3,328	73	10,351
	Gifford Pinchot	963	7,811	18,759	4,106	31,639
	Idaho Panhandle	1,075			1,043	2,118
	Mt. Baker-Snoqualmie	20	1,621	8,027	2,221	11,889
	Okanogan	368	3,776	105		4,249
	Olympic		208	9,296	7,573	17,077
	Umatilla		1,199			1,199
	Wenatchee	2,168	5,767	5,655	267	13,857
	Total	4,706	27,220	45,170	15,283	92,379
West Virginia	George Washington		28	53	25	106
	Monongahela		400	700	60	1,160
Wisconsin			428	753	85	1,266
	Chequamegon	1,761	3,671	2,013	250	7,695
	Nicolet		2,000	1,000		3,000
Wyoming	Total	1,761	5,671	3,013	250	10,695
	Bighorn	390	253			643
	Black Hills					-
	Bridger-Teton		4,849	1,921		6,770
	Medicine Bow	2,401	483			2,884
	Shoshone	578	140			718
Total	Targhee	39	819			858
	Wasatch	257				257
	Total	3,665	6,544	1,921		12,130
Grand Total		353,250	446,223	325,190	225,238	1,349,901

Table B 8.3.--Timber stand improvement needs for fiscal years 1980 through 1985
(acres in thousands and dollars in millions)

	Work needs (Acres)	Annual program appropriated funds (Acres) (Dollars)	
10/1/79 bal.	2,190		
Fiscal year 1980			
new needs	+ 57		^{1/}
accomplishments	- 426	299	37.0
10/1/80 bal.	1,821		
Fiscal year 1981			
new needs	+ 340		^{2/}
accomplishments	- 383	209	32.4
10/1/81 bal.	1,778		
Fiscal year 1982			
new needs	+ 350	^{3/}	^{4/}
accomplishments	- 412	182	28.2
10/1/82 bal.	1,716		
Fiscal year 1983			
new needs	+ 375		^{4/}
accomplishments	- 414	330	51.2
10/1/83 bal.	1,677		
Fiscal year 1984			
new needs	+ 400		^{4/}
accomplishments	- 408	320	49.6
10/1/84 bal.	1,669		
Fiscal year 1985			
new needs	+ 400		^{4/}
accomplishments	- 409	325	50.4
10/1/85 bal.	1,660		

^{1/} Average cost of \$124 per acre.

^{2/} Average cost of \$155 per acre.

^{3/} Includes the Tongass NF acres but not dollars; dollars are not appropriated funds.

^{4/} Average cost of \$155 per acre.

Table B 8.4.--Timber stand improvement needs in acres as of October 1, 1980 by State, Forest and site productivity class

State	National Forest	Acres by site productivity class				Total acres	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+		20-49	50-84	85-119	120+	
		Release					Thinning				
Alabama	Alabama		1,013	676		1,689					
	Chugach		82			82		673	686		1,359
	Tongass-Chatham				815	815			283	850	1,133
	Tongass-Ketchikan				62	62				23,428	23,428
	Tongass-Stikine									3,662	3,662
Arizona	Apache-Sitgreaves		82		877	959		673	969	27,940	29,582
	Coconino						7,666	85,736	1,200		94,602
	Coronado						26,118	22,622			48,740
	Kaibab						4,520	40,538			45,058
	Prescott						500	983			1,483
Arkansas	Tonto						4,016	12,099			16,115
							42,820	161,978	1,200		205,998
	Ouachita		9,174	347		9,521		7,999	933		8,932
	Ozark and St. Francis		3,759	940		4,699		7,126	1,781		8,907
			12,933	1,287		14,220		15,125	2,714		17,839
California	Angeles		306			306		294			294
	Cleveland		157			157		3,816			3,816
	Eldorado		536	2,518	262	3,316			165	94	259
	Inyo	133				133		672			922
	Klamath	878	5,334	3,521	1,042	10,775		250			17,251
	Lassen	97	1,171	4,814	827	6,909		358	843	196	3,461
	Los Padres	220	382	50		652		789	10		799
	Mendocino	213	1,164	625	229	2,231		105	618	375	1,625
	Modoc		455	1,000		1,455		827	2,927		13,663
	Plumas	4,398	9,610	5,388	4,077	23,473		49	4,481	1,584	13,297
	Rogue River			1,425		1,425			57		57
	San Bernardino	240	232	30		502		851	659		5,639
	Sequoia		272	1,352		1,624			770		1,476
	Shasta-Trinity	837	3,525	5,959	3,152	13,473			2,181	1,769	6,340
	Sierra	34	617	866	423	1,940		281	1,600	2,080	6,024
	Siskiyou			515		515			30		30
	Six Rivers		62	5,089	15,295	20,446			2,431	6,980	9,411
	Stanislaus		648	2,386	1,433	4,467			1,296	797	2,482
	Tahoe	5,130	4,235	5,715	3,551	18,631		3,225	2,516	1,793	8,009
	Toiyabe	2,778				2,778		6,706		475	6,706
		14,958	28,706	41,253	30,291	115,208		18,465	45,631	22,588	14,877

Table B 8.4.--Timber stand improvement needs in acres as of October 1, 1980 by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class				Acres by site productivity class				Total acres	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+	20-49	50-84	85-119	120+		20-49	50-84	85-119	120+	
		Release				Thinning									
Colorado	Arapaho and Roosevelt										125,587				125,587
	Grand Mesa, Uncompahgre and Gunnison	1,877	837	173						2,887		1,979	409		6,824
	Manti-LaSal		1,955							1,955		297			297
	Pike and San Isabel	750	970	300						2,020		2,145			2,230
	Rio Grande	2,055	13,131	2,417						17,603		10,937	1,978		14,665
	Routt		314							314					1,611
	San Juan	540	760							1,300		3,385			3,385
Florida	White River		600	323						923		3,143	827		7,440
		5,222	18,567	3,213						27,002		11,352	147,473	3,214	162,039
			1,176	239						1,415					
	Florida														
	Chattahoochee and Oconee	503	2,063	2,704	574					5,844		409	535		944
	Boise		2,365	1,483						3,848		1,744	2,205	1,883	5,832
	Caribou											247			247
Idaho	Challis											393			1,192
	Clearwater	5,235	527	40	225					6,027		25,958	342	44	1,014
	Idaho Panhandle	4,411	2,582	2,286	5,094					14,373		12,534	2,868	20,386	37,711
	Kootenai	407			56					463		20		34	54
	Nezperce	654								654		8,760	210	766	10,179
	Payette											214	1,658	3,186	5,058
	Salmon	143	160							303		3,812	2,506		6,318
Illinois	Sawtooth		70							70		366			366
	Targhee	727	489							1,216		1,237	1,489		2,726
		11,577	6,193	3,809	5,375					26,954		53,334	11,823	26,587	41,085
	Shawnee	680	671	170	113					1,634		720	735	180	1,751
	Hoosier		175	70	61					306			793	300	1,471
	Daniel Boone	112	2,724	1,674	550					5,060		72	6,385	4,387	11,928
	Kitsatchie			209	1,059					1,268			170		170
Maine	White Mountain		100	125	25					250		66	80	15	161
	Hiawatha	477	301	50	9					837		809	511	85	1,419
	Huron-Manistee	1,099	2,128	248	72					3,547		294	351	98	816
	Ottawa		1,225	300						1,525		3,100	750		3,850
		1,576	3,654	598	81					5,909		1,103	3,962	933	6,085
	Chippewa	5,000	2,200							7,200		115			115
	Superior		588	6,000						6,588		100	156	800	1,156
Minnesota		5,000	2,788	6,000						13,788		100	271	800	1,271
				1,757	310					2,067				1,109	1,845
														736	
Mississippi	Mississippi	4,771	7,067	98						11,936		2,313	4,023	336	6,672
Missouri	Mark Twain														

Table B 8.4.--Timber stand improvement needs in acres as of October 1, 1980 by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class					Acres by site productivity class					Total acres	Thinning					Total acres
		20-49	50-84	85-119	120+		20-49	50-84	85-119	120+			20-49	50-84	85-119	120+		
Montana		Release																
	Beaverhead	375	95				470	115	504	38		1,638				2,295		
	Bitterroot	1,876	126	135			2,137	857	1,773			2,926				5,556		
	Custer							324			196					520		
	Deerlodge		210				210	778	1,268	100		10,020				12,166		
	Flathead	252	500		31		783	3,503	9,980	10,983		2,031				26,497		
	Gallatin	65	45	138			248	550	3,370	378		4,609				8,907		
	Helena	659	262	189			1,110	936	452			2,181				3,569		
	Idaho Panhandle						0		688	366						1,054		
	Kootenai	1,555	355	1,086	531		3,527	15,309	45,949	24,084		4,653				106,741		
Nebraska	Lewis and Clark		34			34		3,255								21,027		
	Lolo							5,724	1,994		4,015					12,676		
Nebraska		4,782	1,627	1,548	562	8,519	53,668	36,434	72,963	37,943						201,008		
						0										0		
Nevada	Nebraska	830				830												
	Humboldt	300				300	700									700		
New Hampshire	Toiyabe	1,130				1,130	700									700		
New Mexico	White Mountain																	
	Carson		892	1,115	220	2,227	192	560	700	140		12,683				1,400		
North Carolina	Cibola		192					14,940								27,623		
	Gila							30,110								30,110		
Ohio	Lincoln							58,235	5,546			15,844				79,625		
	Santa Fe		700			700		4,501			670					5,171		
Oklahoma								47,675								47,675		
			892			892	29,197	155,461	5,546							190,204		
Oregon	North Carolina		1,521	872	1,739	4,132		629	100	502						1,231		
	Wayne		93	280	98	471		197	745	310						1,252		
Oregon	Ouachita		2,031			2,031		2,022	30							2,052		
	Deschutes	310	1,541	887		2,738	2,460	5,649	838							8,947		
Oregon	Fremont		869	35		904	714	13,133	2,802							16,649		
	Malheur		127	102		229	9,424	2,499								11,923		
Oregon	Mt. Hood		203	1,993	56	2,252		1,997	4,919	1,987						8,903		
	Ochoco	50				50	2,817	1,119								3,936		
Oregon	Rogue River			16,983	496	17,479		32	3,472	20						3,524		
	Siskiyou		504	5,144	3,581	9,229		170	1,599	1,146						2,915		
Oregon	Siuslaw				7,152	7,152				5,813						5,813		
	Umatilla																	
Oregon	Umpqua		1,344	3,215	1,591	6,150	2,100	5,521	3,000							10,621		
	Wallowa-Whitman		500	606		1,106	18	1,699	7,120	2,177						11,014		
Oregon	Willamette		570	6,162	12,731	19,463	6,596	5,829	2,716							15,141		
	Winema							123	2,792	14,056						16,971		
Oregon							4,015	20,152	5,495							29,662		
		360	5,658	35,127	25,607	66,752	28,144	57,923	34,753	25,199						146,019		

Table B 8.4.--Timber stand improvement needs in acres as of October 1, 1980 by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class				Total acres	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+		20-49	50-84	85-119	120+	
		Release					Thinning				
Pennsylvania	Allegheny			1,303		1,303		500	1,660	300	2,460
	Caribbean										
	South Carolina		359	418	433	1,210	453		831	604	1,888
	South Dakota						14,086				14,086
	Tennessee	50	1,824	1,928	1,257	5,059		1,216	433	169	1,818
	Texas		520	784		1,304		680	1,098		1,778
	Utah	295	34			329	7,931	3,471			11,402
							1,818	6,175			7,993
		359				359	40	60			100
			6,089			6,089		2,704			2,704
Vermont	Sawtooth					0					0
	Uinta									111	111
	Wasatch						4,841	998	138		5,977
	Green Mountain	654	6,123			6,777	14,630	13,408	249		28,287
	George Washington	7,322	651	1,190		9,163	10,652	1,065	1,598		13,315
	Jefferson	69	60	380	425	934	363	976	366	157	1,862
			185	314	283	782		412	860	317	1,589
		69	245	694	708	1,716	363	1,388	1,226	474	3,451
	Colville		874	1,814	160	2,848		3,777	3,060	199	7,036
	Gifford Pinchot		802	452	944	2,198	6,626	7,180	15,003	4,686	33,495
Washington	Idaho Panhandle				343	343	349		80	752	1,181
	Mt. Baker-Snoqualmie			287	967	1,254		1,218	3,485	2,217	6,920
	Okanogan						599	9,897			10,496
	Olympic		95	12		107	59	1,026	3,784	4,185	9,054
	Umatilla						85	2,229			2,314
	Wenatchee		400	416	380	1,196	1,513	13,407	1,481	492	16,893
			2,171	2,981	2,794	7,946	9,231	38,734	26,893	12,531	87,389
	George Washington	53	79	35	264	431		162	82	16	260
	Monongahela							2,500	8,000	627	11,127
	West Virginia		53	79	35	264	431		2,662	8,082	643
Chequamegon		250	1,665	400	350	2,665		250	364	50	664
Nicolet			440	235		675		160	90		250
Wisconsin		250	2,105	635	350	3,340		410	454	50	914

Table B 8.4.--Timber stand improvement needs in acres as of October 1, 1980 by State, Forest and site productivity class (con.)

State	National Forest	Acres by site productivity class				Acres by site productivity class				Total acres	Acres by site productivity class				Total acres
		20-49	50-84	85-119	120+	20-49	50-84	85-119	120+		20-49	50-84	85-119	120+	
		Release				Thinning									
Wyoming	Bighorn	29,904	1,505			7,595				31,409	7,595				7,595
	Black Hills					5,000									5,000
	Bridger-Teton														
	Medicine Bow	2,062	66			6,584	3,679	550		2,128					4,229
	Shoshone	2,234				8,439	277			2,234					6,584
	Targhee														8,716
	Wasatch					349									0
		34,200	1,571			27,967	3,956	550		35,771	27,967	3,956	550		349
Grand Total		93,269	116,274	112,792	73,348	318,917	717,045	224,091	165,205	395,683	318,917	717,045	224,091	165,205	1,425,258
Grand Total -- Release and Thinning		1,820,941													

Table B 8.5.--Certification of reforestation and timber stand improvement acreages by Region

REGION	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10	Total
Reforestation										
Plant and seed:	10,820	5,799	1,181	5,770	1,634	109,657	45,948	9,125	100	190,034
Natural regen:										
w/site prep.	6,146	2,361		4,163		2,938	21,081	17,135		53,824
w/o site prep.		3,603	404	1,649	84	4,377	382	3,105	8,208	21,812
Total	16,966	11,763	1,585	11,582	1,718	116,972	67,411	29,365	8,308	265,670
TSI										
Release	335	5,094	500	2,351	0	14,747	38,357	25,177	418	86,979
Pre-commercial										
thinning	2,769	24,730	99,896	13,456	700	50,301	17,803	15,437	2,770	227,862
Fertilization						7,841				7,841
Total	3,104	29,824	100,396	15,807	700	72,889	56,160	40,614	3,188	322,682

Table B 8.6.--Certification of reforestation and timber stand improvement acreages by State and Forest

State	National Forest	Plant and seed	Natural regener. w/site prep.	Natural regener. w/o site prep.	Total refor.	Release	Pre- commercial thinning	Fert.	Total TSI
Alabama	Alabama	1,866			1,866	18			18
	Chugach	100		28	128	18			18
	Tongass-Chatham			2,003	2,003	400	711		1,111
	Tongass-Ketchikan			6,177	6,177		1,003		1,003
	Tongass-Stikine						1,056		1,056
Arizona	Total	100		8,208	8,308	418	2,770		3,188
	Apache-Sitgreaves	660			660		30,514		30,514
	Coconino	22			22		21,015		21,015
	Coronada						1,573		1,573
	Kaibab	266		362	628		10,509		10,509
	Prescott					200	357		557
	Tonto						2,612		2,61
Arkansas	Total	948		362	1,310	200	66,580		66,780
	Ouachita	5,636	3,975		9,611	4,751	3,261		8,012
	Ozark and St. Francis								
California	Total	3,290	1,916		5,206	4,649	2,510		7,159
	Angeles	8,926	5,891		14,817	9,400	5,771		15,171
	Cleveland	-							
	Eldorado	173			173				
	Injo	-							
	Klamath	-		10	10				
	Lassen	-							
	Los Padres	-							
	Mendocino	-							
	Modoc	-							
	Plumas	-		74	74		700		700
	Rogue River	-							
	San Bernardino	-							
	Sequoia	-							
	Shasta-Trinity	1,461			1,461				
	Sierra	-							

Table B 8.6.--Certification of reforestation and timber stand improvement acreages by State and Forest (con.)

State	National Forest	Plant and seed	Natural regener. w/site prep.	Natural regener. w/o site prep.	Total refor.	Release	Pre-commercial thinning	Fert.	Total TSI
(Con.) California	Siskiyou	9			9				
	Six Rivers	-							
	Stanislaus	-							
	Tahoe	-							
	Toiyabe			84	1,727		74		74
Total		1,643					774		774
Colorado	Arapaho and Roosevelt	514		2,250	2,764		1,945		1,945
	Grand Mesa, Uncompahgre and Gunnison	-				1,052	3,476		4,528
	Manti-LaSal	-				150	210		360
	Pike and San Isabel	202			202		1,367		1,367
	Rio Grande	375			375	1,020	505		1,525
	Routt	803	922		1,725	740	489		1,229
	San Juan	2,892		540	3,432	357	200		557
	White River	-					450		450
	Total	4,786	922	2,790	8,498	3,319	8,642		11,961
		9,504	264	176	9,944	200			200
Florida Georgia	Florida								
	Chattahoochee and Oconee	4,210	1,748		5,958	3,305	92		3,397
Idaho	Boise	1,717			1,717		2,285		2,285
	Caribou	462		24	486				
	Challis	428			428		403		403
	Clearwater	1,024	435		1,459				
	Idaho Panhandle	1,543	366		1,909		33		33
	Kootenai								
	Nezperce	1,894			1,894		30		30
	Payette	-							
	Salmon	651	1,385		20,036	182	2,267		2,449
	Sawtooth	793	95		888	206	255		461
Targhee		66	2,210		2,276	1,415	746		2,161
	Total	8,578	4,491	24	13,093	1,803	6,019		7,822

Table B 8.6.--Certification of reforestation and timber stand improvement acreages by State and Forest (con.)

State	National Forest	Plant and seed	Natural regener. w/site prep.	Natural regener. w/o site prep.	Total refor.	Release	Pre-commercial thinning	Fert.	Total TSI
Illinois	Shawnee	1,241	65		1,306	398	148		546
	Wayne-Hoosier	-				108			108
	Daniel Boone	2,029	553		2,582	6,134	1,065		7,199
	Kisatchie	2,408	1,538	80	4,026	1,424	817		2,241
	White Mountain	-				166			166
Michigan	Hiawatha	1,030	452		1,482	449	447		896
	Huron-Manistee	297	850	421	1,568	2,071	193		2,264
	Ottawa	-				1,493	4,672		6,165
	Total	1,327	1,302	421	3,050	4,013	5,312		9,325
Minnesota	Chippewa	192	1,884		2,076	886			886
	Superior	4,000		2,500	6,500	6,761			6,761
	Total	4,192	1,884	2,500	2,076	7,647			7,647
Mississippi	Mississippi	6,098	4,439		10,537	7,839	1,832		9,671
Missouri	Mark Twain	1,510	6,967		8,477	8,540	3,355		11,895
Montana	Beaverhead	520	168		688				
	Bitterroot	209	150		359				
	Custer	-					176		176
	Deerlodge	594	1,685		2,279		260		260
	Flathead	66	167		233		1,303		1,303
	Gallatin	238	519		757				
	Helena	901	289		1,190	148	121		269
	Idaho Panhandle								
	Kootenai	2,843	1,933		4,776	187	795		982
	Lewis and Clark	224	82		306				
	Lolo	747	352		1,099		51		51
Nebraska	Total	6,342	5,345		11,687	335	2,706		3,041
	Nebraska	-							
	Humbolt	-							
	Toiyabe	-							
Nevada	Total	-							

Table B 8.6.--Certification of reforestation and timber stand improvement acreages by State and Forest (con.)

State	National Forest	Plant and seed	Natural regener. w/site prep.	Natural regener. w/o site prep.	Total refor.	Release	Pre-commercial thinning	Fert.	Total TSI
New Hampshire New Mexico	White Mountain	-	69		69		62		62
	Carson	-					10,168		10,168
	Cibola	-					3,505		3,505
	Gila	233		42	275		5,977		5,977
	Lincoln	-					1,543		1,543
North Carolina Ohio	Santa Fe	-				300	12,123		12,423
		233		42	275	300	33,316		33,616
	North Carolina	2,589	1,362		3,951	2,140	1,420		3,560
	Wayne-Hoosier	-				171			171
		1,679	185		1,864	636	863		1,499
Oklahoma Oregon	Ouachita	981		220	1,201	5	2,697		2,702
	Deschutes	5,116			5,116		3,284		3,284
	Fremont	128			128		3,963		3,963
	Malheur						1,774		1,932
	Mt. Hood	5,728	220	311	6,259	158	1,640		1,640
Pennsylvania Puerto Rico	Ochoco	1,004			1,004		1,294		3,185
	Rogue River	3,698			3,698	1,891	752		5,495
	Siskiyou	3,431	33	249	3,713	4,743	4,639		7,509
	Siuslaw	23,483			23,483	2,870	1,457		1,858
	Umatilla	1,222			1,222	401	3,719	1,396	6,474
South Carolina South Dakota	Umpqua	9,899		78	9,977	1,359	314	184	498
	Wallowa-Whitman	-					2,996	1,659	5,827
	Willamette	13,933	680	231	14,844	1,172	4,752		4,752
	Winema	5,996		412	6,408		33,281	3,239	49,119
		74,619	933	1,501	77,053	12,599	1,316		1,316
Tennessee Texas	Allegheny		1,305	46	1,351				1,202
	Caribbean	250			250	1,202			4,129
	South Carolina	1,785	2,295		4,080	2,044	12,885		12,885
	Black Hills	80			80		1,195		2,832
	Cherokee	499	1,081	79	1,659	1,637	1,045		1,432
Utah	Texas	2,875	239		3,114	387	502		527
	Ashley			10	10	25	3,280		3,292
	Dixie					12			

Table B 8.6.--Certification of reforestation and timber stand improvement acreages by State and Forest (con.)

State	National Forest	Plant and seed	Natural regener. w/site prep.	Natural regener. w/o site prep.	Total refor.	Release	Pre commercial thinning	Fert.	Total TSI
(Con.) Utah	Fishlake					297	68		365
	Manti-LaSal					50	153		203
	Sawtooth					14			14
	Uinta	70	448		518				
	Wasatch	32	25	1,347	1,404		1,766		1,766
	Total	102	473	1,357	1,932	398	5,769		6,167
	Green Mountain	104	1,523	5	1,632	2,524	5		2,529
	George Washington	522	519	47	1,088	1,023	339		1,362
	Jefferson	708	827		1,535	922	1,279		2,201
	Total	1,230	1,346	47	2,623	1,945	1,618		3,563
Washington	Colville	4,971	576	1,375	6,922	1,464	3,496		4,960
	Gifford Pinchot	8,556			8,556		1,837		1,837
	Idaho Panhandle	17			17				
	Mt. Baker-Snoqualmie	7,457	166	328	7,951	539	2,066	2,448	5,053
	Okanogan	87	521	700	1,308		5,352		5,352
	Olympic	7,253	723	369	8,345	145	4,214	2,154	6,513
	Umatilla	443			443		55		55
	Wenatchee	6,262	19	104	6,385				
	Total	35,046	2,005	2,876	39,927	2,148	17,020	4,602	23,770
			140		140	46			46
West Virginia	George Washington						4,923		4,923
	Monongahela		140		140	46	4,923		4,969
	Total								
Wisconsin	Chequamegon	596	1,700	133	2,429	984	266		1,250
	Nicolet	155	2,320		2,475	626	50		676
	Total	751	4,020	133	4,904	1,610	316		1,926
Wyoming	Bighorn			760	760	886	203		1,089
	Black Hills	75		75			1,400		1,400
	Bridger-Teton	1,551		268	1,819		1,105		1,105
	Medicine Bow	559	1,439		1,998	110	1,810		1,920
	Shoshone	299		53	352	929			929
	Targhee						24		24
	Wasatch						318		318
	Total	2,484	1,439	1,081	5,004	1,925	4,860		6,785
Grand Total		190,034	53,824	21,812	265,670	86,979	227,862	7,841	322,682

APPENDIX B 9

Table B 9.1.--Comparison of planned and completed minerals operating plans by Region--fiscal year 1980

Regions	Budget allocation operating plans	Actual accomplishment operating plans
1	2,207	3,578
2	1,481	1,691
3	1,042	1,355
4	3,411	4,456
5	1,874	1,999
6	2,009	2,628
8	2,543	2,579
9	1,176	3,116
10	122	106
Total	15,865	21,508

Table B 9.2.--Energy mineral production--fiscal years 1977-1980

Fiscal year	Acres under lease (millions)	Energy- related operating plans (number)	Non-energy related operating plans (number)	Oil (barrels)	Gas (M cu. ft.)	Coal (tons)
1977	17.5	7,120	5,520	8,114,314	210,000,000	4,230,541
1978	23.0	8,700	5,800	9,280,715	212,200,000	5,100,000
1979	24.9	9,801	5,756	11,130,200	213,250,000	6,240,000
1980	25.0 ^{1/}	13,980	7,528	12,210,000 ^{1/}	220,000,000 ^{1/}	6,500,000 ^{1/}

^{1/} Estimated locatable and salable minerals were produced but not reported.

Table B 9.3.--Minerals program review 1977-1980

Fiscal year	Appropriated funds Million \$	Increase		Operating plans administ. Number	Increase		Backlog ^{1/} Number	Cost/ plan Dollars
		Million \$	Percent		Number	Percent		
1977	9.08	-	-	12,640	-	-	-	718
1978	10.485	1.4	+15	14,500	1,860	+15	-	723
1979	11.075	0.59	+ 6	15,557	1,057	+ 7	6,000	712
1980	13.457 ^{2/}	2.38	+21	21,508 ^{3/}	5,951	+38	7,300	617

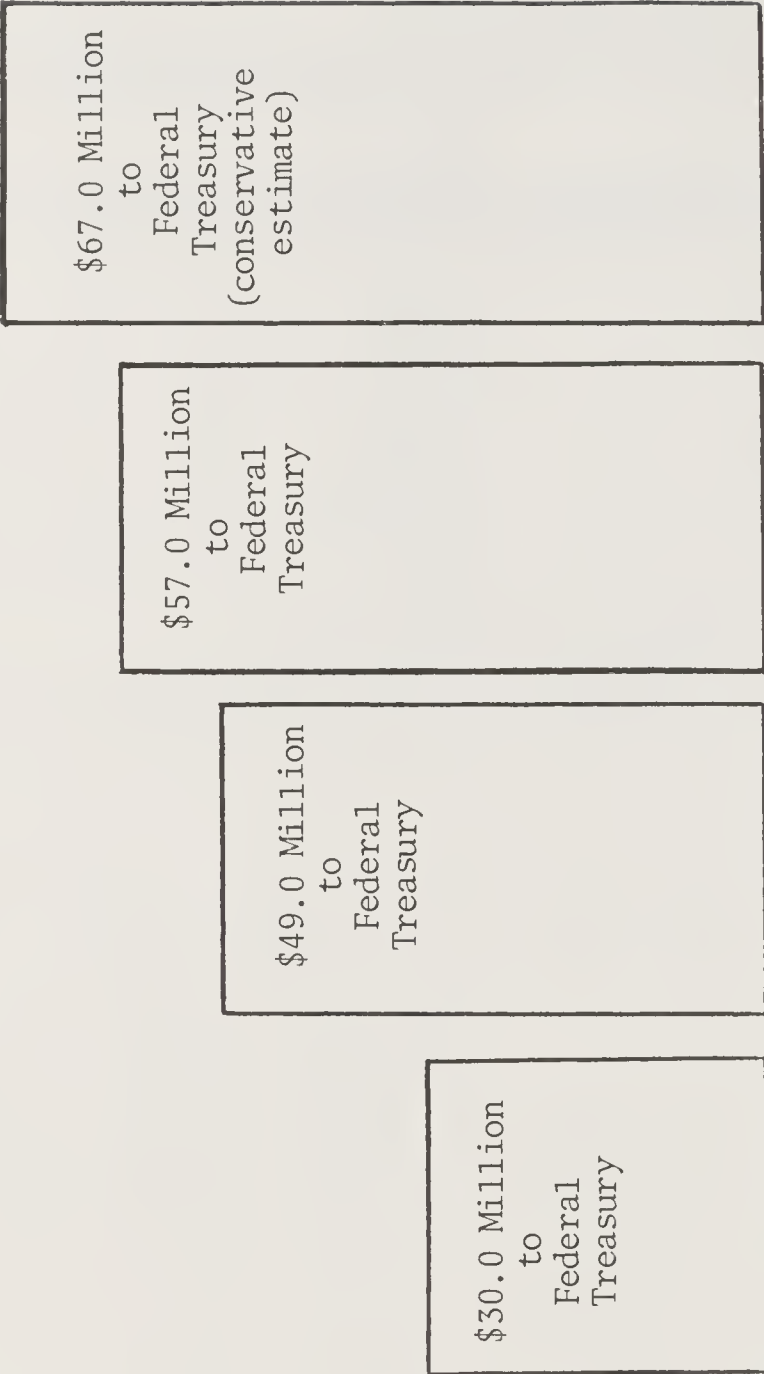
^{1/} Application or plans pending but not approved.
^{2/} 48 percent increase in appropriated dollars from 1977.
^{3/} 70 percent increase in total number of plans administered from 1977.

Table B 9.4.--Minerals program costs and outputs

Return to
Federal Treasury
is based on:

- *Lease rental fees
- *Royalties
- *Bonus bid fees

For NFS Lands
*Public Domain
*Acquired Lands



APPENDIX B 10

Table B 10.1.--Fuels treatment acreages accomplished by appropriation--fiscal year 1980

Region ^{1/}	Target	FFP ^{2/}	Appropriation HRP ^{3/}	Subtotal	BD ^{4/}	Total
1	18,600	18,857	1,658	20,515	25,000	45,515
2	15,000	15,226	597	15,823	10,000	25,823
3	26,400	66,161	6,282	72,443	73,000	145,443
4	16,200	17,006	1,230	18,236	43,000	61,236
5	12,600	33,492	5,316	38,808	40,050	78,858
6	24,600	24,719	9,457	34,176	340,000	374,176
8	147,400	176,912	18,238	195,150	0	195,150
9	4,200	4,069	1,278	5,347	4,000	9,347
Total	264,000	356,442	44,056	400,498	535,050	935,548

^{1/} No fuels targets in R-10.^{2/} Forest fire protection funds.^{3/} Human Resource Program funds.^{4/} Brush disposal funds.

APPENDIX B 11

Table B 11.1.--Road and bridge construction and reconstruction

State or Commonwealth	From appropriated funds			By timber purchasers		
	Road	Bridges	Dollars	Road	Bridges	Dollars
	Miles	Number	Thousand	Miles ^{1/}	Number	Thousand
Alabama	20.0	1	2,011	19.0	-	568
Alaska	7.3	3	11,704	59.6	24	6,418
Arizona	13.3	-	7,733	334.0	-	5,273
Arkansas	42.0	2	3,445	82.0	-	2,072
California	91.7	11	40,900	1,640.0	6	40,800
Colorado	12.6	8	8,242	185.2	-	1,360
Florida	4.0	2	904	78.0	-	1,086
Georgia	13.0	-	1,380	30.0	-	592
Idaho	86.0	13	23,740	862.0	5	18,384
Illinois	3.9	-	124	5.8	-	39
Indiana	0.1	-	34	0.3	-	24
Kentucky	17.0	-	1,322	13.0	-	189
Louisiana	4.0	7	1,472	102.0	3	3,196
Maine	-	-	-	7.0	3	310
Michigan	10.6	2	593	59.4	-	250
Minnesota	31.5	5	1,802	69.6	-	584
Mississippi	3.0	3	1,116	82.0	5	1,110
Missouri	0.5	-	132	44.2	-	213
Montana	88.0	14	21,728	560.0	3	9,922
Nebraska	-	-	12	-	-	-
Nevada	-	2	380	-	-	-
New Hampshire	1.6	2	501	11.6	4	589
New Mexico	5.3	1	3,807	252.0	-	2,432
New York	-	-	-	-	-	-
North Carolina	46.0	8	3,902	49.0	-	1,005
North Dakota	-	-	61	-	-	-
Ohio	0.4	-	24	-	-	-
Oklahoma	-	-	157	4.0	-	363
Oregon	106.0	21	43,054	2,353.0	4	77,207
Pennsylvania	16.2	-	491	17.1	-	268
Puerto Rico	-	-	5	-	-	-
South Carolina	16.2	5	1,521	79.0	6	2,151
South Dakota	-	-	1,762	151.3	-	1,426
Tennessee	38.0	-	1,873	40.0	-	858
Texas	5.0	-	1,241	49.0	-	1,380
Utah	28.0	2	3,901	67.0	-	536
Vermont	7.7	2	444	1.9	-	39
Virginia	75.0	4	3,946	10.0	-	248
Washington	36.0	2	19,614	505.0	-	19,393
West Virginia	27.0	-	1,710	2.1	-	117
Wisconsin	63.0	3	987	40.3	-	204
Wyoming	3.1	2	3,961	155.1	1	1,050
Total	923.3	125	221,736	8,020.5	64	201,656

^{1/}Does not include 1,541 miles turned back to Forest Service for construction.

Table B 11.2.--Timber purchaser roads constructed by the Forest Service

State or Commonwealth	Road (miles)	Dollars (M)
Alabama	14.0	338
Alaska		
Arizona		
Arkansas	33.0	1,197
California	233.0	6,000
Colorado		
Florida	4.0	406
Georgia		
Idaho	105.0	2,606
Illinois		
Indiana		
Kentucky		
Louisiana	4.0	183
Maine		
Michigan	3.5	47
Minnesota	2.4	44
Mississippi	10.0	321
Missouri		
Montana	112.0	2,124
Nebraska		
Nevada		
New Hampshire	2.6	84
New Mexico	37.0	695
New York		
North Carolina	4.0	46
North Dakota		
Ohio		
Oklahoma	5.0	108
Oregon	593.0	22,136
Pennsylvania	3.6	119
Puerto Rico		
South Carolina	17.0	249
South Dakota	45.2	786
Tennessee	3.0	61
Texas	13.0	403
Utah		
Vermont	1.1	69
Virginia	2.0	26
Washington	266.0	15,672
West Virginia		
Wisconsin	3.2	44
Wyoming	24.4	455
Total	1,541.0	54,219

APPENDIX B 12

Table B 12.1.--Miles of landline location by Region--fiscal year 1980

Region	Total Boundary	1980 Target	1980 Accomplishment	Done to date
1	30,664	351	421.0	2,195.0
2	51,433	216	201.2	1,317.2
3	19,199	367	490.0	3,315.0
4	28,659	289	286.7	1,909.7
5	29,577	1,670	1,043.0	2,977.0
6	25,726	1,264	1,093.3	3,954.3
8	42,280	1,716	1,716.0	29,564.0
9	42,642	350	432.8	2,378.8
10	1,536	52	68.8	276.8
Totals	272,000	6,275	5,752.8	47,884.8

Table B 12.2.--Land acquisition and exchange

	Acres (number)	Cases (number)	Value
Purchase ^{1/}	62,857	334	\$ 59,666,696
Exchange ^{2/}	75,828	141	\$ 61,601,951
Donation ^{1/}	2,206	20	\$ 909,358
Special studies ^{3/}	183,200	8	\$ 90,000,000

^{1/} Acres acquired.^{2/} Acres offered-approved.^{3/} Made for land transfers, interchanges, boundary modifications.

APPENDIX C

STATE AND PRIVATE FORESTRY PROGRAM

APPENDIX C 1

Table C 1.1.--State and Private Forestry Program appropriations
(dollars in thousands)

	1980 RPA recommended program	FY 1980 appropriation	Percent of RPA
Forest Insect and Disease Management	\$ 38,413	\$20,453	53
Rural Fire Prevention and Control	42,398	22,411	53
Rural Forestry Assistance	29,521	13,410	45
Urban Forestry Assistance	5,060	3,608	71
Assistance in Management, Planning, and Technology Implementation	7,003	3,710	53
Totals/averages	\$122,395	\$ 63,592	52

APPENDIX C 2

Small Watershed Operations (P.L. 566)

The Watershed Protection and Flood Prevention Act of 1954, as amended, (P.L. 566) authorizes and directs the Secretary of Agriculture to cooperate with and assist, qualified State agencies and local organizations in planning and carrying out watershed protection and flood prevention measures on authorized watersheds not exceeding 250,000 acres. Overall program responsibility rests with the Soil Conservation Service. The Forest Service is responsible for the installation of planned forest land treatment measures and certain structural works on National Forests and other Forest Service-administered lands; and on non-Federal forest land in cooperation with, and through, State forestry and local agencies.

Annual allocations are made for the installation of measures included in approved watershed work plans. The majority of the Forest Service allocated funds are used to reimburse the State forestry agencies for assistance to landowners in approved watershed projects.

Appendix table C 2.1, page 124, shows total forest land treatment measures installed in fiscal year 1980 on all forest lands within 130 authorized watershed projects and with \$950,000 of Forest Service allocated funds. (The dollars shown are the Forest Service's share of the total funds appropriated to the Soil Conservation Service.)

Table C 2.1.--Works of improvement installed in watershed protection projects
(Pilot and P.L. 566) in fiscal year 1980 and to date

Works of improvement	Unit	Installed in 1980 with assistance under the Watershed Protection Program	Est. practices "On The Land" in active projects as of 9/30/80
<u>LAND TREATMENT MEASURES</u>			
Channel improvement	miles	-	6.6
Channel stabilization	miles	-	13
Contour terrace and furrows	miles	-	916.7
Area treated	acres	-	14,409
Gully control and stabilization	miles	-	195.1
Grade stabilization structures	number	-	3,296
Critical area stabilization by tree planting and other measures	acres	452.2	43,227.6
Forest road and roadbank stabilization	miles	551.9	2,445.6
Acres treated	acres	2,138.4	8,037.5
Fire, roads, trails, and firebreaks and fuelbreaks	miles	21.7	153.7
Fire control water developments	number	-	43
Fire towers	number	-	8
Intensified fire protection	acres	140	2,301,335
Heliports and helispots	number	-	42
Mobile fire equipment	number	-	60
Other fire control improvements	number	-	458
Radio installations	number	-	52
Forest watershed management			
Plans prepared	number	1,322	19,089
Area included	acres	90,612	1,990,315
Forest stand improvement	acres	20	1,082,466
Proper harvest cutting	acres	13,436	518,372
Range and grass seeding	acres	121	47,611
Tree planting and seeding	acres	8,289	276,851
Revegetation, surface mined areas	acres	-	1,805
Woodland thinning and release	acres	4,554	702,059
Woodland grazing control	acres	857	289,138
Recreation area development	acres	384	31,792
Wildlife habitat development	acres	1,266	27,671
Wildlife ponds	number	22	75

Flood Prevention Operations (P.L. 534)

The Flood Control Act of 1944 authorizes and directs the Secretary of Agriculture to carry out works of improvement for flood prevention purposes and to install measures for runoff and waterflow retardation and soil erosion prevention on 11 authorized flood prevention projects. The program is responsible for the restoration and preservation of desirable watershed conditions on forest lands that will help prevent floods and control sediment by means of land treatment and structural measures.

In fiscal year 1980, annual allocations to the Forest Service were made for the installation of measures in eight authorized flood prevention projects. Appendix table C 3.1, page 126, shows total measures installed on all forest lands in fiscal year 1980 within these authorized flood prevention projects and with \$3,902,000 of Forest Service allocated funds. The eight projects' major accomplishments during fiscal year 1980 are briefly discussed below.

Little Sioux River Flood Prevention Project, Iowa. Forestry measures are installed through the Iowa Department of Conservation in cooperation with the USDA Forest Service. During fiscal year 1980, 24 forest management plans covering 1,177 acres were completed. Forty woodland owners were assisted. Proper harvest cutting was applied on 32 acres. One hundred and forty-seven acres of trees were planted. Woodland grazing control was accomplished on 293 acres. One hundred and twenty-two acres of outdoor recreation development and 303 acres of wildlife habitat development were accomplished.

Los Angeles River Flood Prevention Project, California. Project activities by the Forest Service continued on the Angeles National Forest lands and on non-Federal lands in cooperation with Los Angeles County and Los Angeles City fire departments.

The fire management program accomplishments in fiscal year 1980 consisted of 14 miles of fuelbreak construction, one fire control water development, one helispot, and 15,000 acres of intensified fire protection.

The critical area stabilization program consisted of 110 acres of tree planting for critical area stabilization, stabilization of 330 acres along 41 miles of forest roads, one mile of channel stabilization, and two forest management plans.

Table C 3.1.--Works of improvement installed in flood prevention projects
(P.L. 534) in fiscal year 1980 and to date

Item	Unit	Installed in 1980 all funds)	Estimated total practices on land as of 9/30/80
<u>STRUCTURAL MEASURES</u>			
Access road construction	miles	9	154
Channel improvement	miles	1	39.6
Channel stabilization	miles	1.1	349.5
Diversion ditches	lin. ft.	-	30,477
Floodwater retarding structures	number	-	3
Grade stabilization structures	number	-	1,115
Streambank stabilization	miles	-	11.3
<u>LAND TREATMENT MEASURES</u>			
Critical area stabilization by tree planting & other measures	acres	513	332,311.1
Forest road and roadbank Stabilization	miles	213.3	2,144.8
Area treated	acres	707	18,818.9
Forest watershed management plans	number	1,133	20,872
Area included	acres	70,294	1,981,948
Firebreaks and fuelbreaks	miles	43	3,346
Fire roads and trails	miles	13	538.6
Fire hazard reduction	acres	-	12,125.3
Fire water developments	number	2	185
Fire towers	number	-	46
Heliports and helispots	number	1	460
Mobile equipment	number	-	120
Other fire improvements	number	1	217
Permanent radio installations	number	5	318
Proper harvest cutting	acres	51,064	592,664
Forest stand improvement	acres	-	660,464
Tree planting and seeding	acres	9,492	505,378
Woodland thinning and release	acres	1,185	446,327
Revegetation, surface mined areas	acres	170	7,431
Woodland grazing control	acres	1,795	186,382
Woodland owners assisted	number	11,316	149,201

Potomac River Flood Prevention Project, MD, VA, and WV. The Forest Service cooperated with three States and their forestry agencies in the installation of land treatment on State and private forest lands. Additional land treatment was installed by the Forest Service on National Forests in Virginia.

Accomplishments on State and private forest lands during fiscal year 1980 included 9 miles of access road construction; 31 acres of critical area stabilization; 27.3 miles of forest road and roadbank stabilization; 629 forest management plans involving 22,986 acres; 12 miles of fire-breaks; 2 miles of fire road and trail construction; 1,516 acres of proper harvest cutting; 1,397 acres of tree planting; 814 acres of timber stand improvement; 60 acres of revegetated surface mined areas; 1,412 acres of forest grazing control; 41 acres of wildlife habitat development; 16 acres of outdoor recreation development; and 3,362 forest land-owners assisted.

Accomplishments on National Forest land included 1 mile of channel improvement, 1 mile of channel stabilization, and 38 miles of forest road and roadbank stabilization.

Santa Ynez Flood Prevention Project, California. The Forest Service activities include protection and improvement of the mountainous western portions of this project.

Accomplishments in fiscal year 1980 include 5 miles of fuelbreak construction and 12 miles of maintenance. One fire control water development was constructed. A 2,000-acre area was prescribed burned and 500 acres of this area was seeded. One forest soil land management plan was developed. Intensified fire protection was accomplished on 6,300 acres.

Trinity River Flood Prevention Project, Texas. The Forest Service has continued its participation in the planning and installation of structural and land treatment measures on those lands in the project which fall within the National Grasslands.

Watershed improvement plans were completed in nine National Grasslands units. Fifty-two acres of watershed improvement work was completed on the Denton Creek Subwatershed. This work included vibratilling, disking, seeding, sprigging, mulching, and fertilizing these acres. Maintenance work was done on three units which included fertilizing, replanting, gully plugs, and terraces.

Washita River Flood Prevention Project, Oklahoma. The Forest Service and Oklahoma Division of Forestry participated in the planning and accomplishment of flood prevention measures for private forest lands in the project area. Additional land treatment was installed by the Forest Service on National Grasslands.

A moderate increase of forestry activity occurred in fiscal year 1980, the highlights being 32 acres of critical area stabilization and

138 acres of timber stand improvement. Particularly evident was management planning activity, with 38 plans prepared or revised on 398 acres. Planning was done for the upcoming tree planting season. About 85 landowners were contacted following aerial photograph work to urge them to plant trees for erosion control. The County Commissioners of three counties have agreed to plant black locust on several roadside erosion areas. About 4,800 linear feet was planted to trees for windbreaks. Forestry programs were presented to ten local rural groups with 375 attendees.

Accomplishments on the National Grasslands include 12 acres of tree planting, 10 acres of range and grass seeding, one forest land management plan, and 10 acres of forest grazing control.

Yazoo and Little Tallahatchie Rivers Projects, Mississippi. Forestry measures for both of these projects are provided by the Forest Service. These two projects are conducted concurrently. Work by other agencies and industries have contributed to the overall accomplishments.

In fiscal year 1980, 838 miles of gully control stabilization and 251 acres of critical area stabilization were accomplished. Four hundred and thirty-nine forest management plans were prepared and revised covering 45,733 acres. Proper harvest cutting was accomplished on 49,516 acres. There were 7,918 acres planted to trees. Other accomplishments include 107 miles of forest road and roadbank stabilization, 14 miles of fire roads and trails construction, 5 radio installations, 233 acres of timber stand improvement, 110 acres of surface mined areas revegetated, 705 acres of outdoor recreation development, and 1,034 acres of wildlife habitat improvement. A total of 7,828 forest landowners were assisted during fiscal year 1980.

Accomplishments on National Forest lands included 47 acres of critical area stabilization and 14 acres of forest road and roadbank stabilization.

APPENDIX C 4

Table C 4.1.--Targets and accomplishments for cooperative forestry assistance programs--fiscal year 1980

Item	Unit of measure	RPA Estimates		FY 1980 funded targets	FY 1980 accomplish- ments	Percent of funded target
		High	Low			
Technical Assist--Forest Land Mgmt. Plans	Thousand plans	80.6	74.1	36.8	50.9	138
Technical Assist--Forest Land Mgmt. Plans	Thousand acres	5,600.0	5,200.0	2,642.6	4,308.2	163
Recreation Technical Assistance	Thousand acres	1,050.0	1,025.0	99.9	116.6	117
Wildlife and Fish Technical Assistance	Thousand acres	2,200.0	2,025.0	104.3	194.5	187
Forest Range Improvement	Thousand acres	2,200.0	2,100.0	57.5	63.3	110
Technical Assist--Timber Harvesting	Million cu. ft.	--	--	191.4	211.0	110
Reforestation	Thousand acres	707.0	652.0	413.1	465.6	113
Forest Incentives Program	Thousand acres	--	--	(205.7)	(219.0)	107
Timber Stand Improvement	Thousand acres	416.0	384.0	293.6	231.7	79
Forest Incentives Program	Thousand acres	--	--	(127.4)	(123.0)	97
Seedling Production and Distribution-- State Nurseries	Million seedlings	967.0	892.0	508.5	691.7	136
Improved Utilization	MMCF	393.0	362.0	170.9	171.8	101
U&CF Assistance	Urban areas asst'd	1,900.0	1,824.0	8,450.0	3,609.0	43

1/ For equivalency with current planning and reporting requirements, the indicated 1975 RPA Recommended Program units of measure have been converted.

2/ Includes non-cost share, FIP, and ACP. FY 1980 accomplishment differs from figure in FY 1982 Explanatory Notes since that figure only includes non-cost share.

Table C 4.2.--Summary of selected cooperative forest management and processing program activities--fiscal years 1940-1980

Summary Fiscal Year	Woodland owners assisted (Number)	Area of woodland involved (Acres)	Progress	
			Timber sale assistance-- volume marked (M bd. ft.)	Loggers and processors assisted (Number)
1940	--	--	--	--
1941	165	49,416	2,667	--
1942	224	92,442	10,076	--
1943	3,242	359,388	75,600	--
1944	8,842	742,697	323,557	--
1945	8,093	831,347	411,330	--
1946	12,083	1,321,746	452,367	--
1947	13,531	1,576,888	502,312	--
1948	14,220	1,399,971	503,641	--
1949	17,140	1,769,240	437,903	--
1950	22,828	2,542,564	518,566	--
1951	25,352	2,558,091	721,938	6,451
1952	27,933	2,501,317	609,562	9,429
1953	32,474	2,827,709	527,419	9,579
1954	32,224	2,557,993	538,391	8,429
1955	34,828	2,914,026	549,373	8,182
1956	38,121	3,124,744	625,592	9,254
1957	44,494	3,086,143	538,958	7,933
1958	58,752	3,435,719	444,797	8,926
1959	76,546	4,146,146	659,850	10,846
1960	82,188	4,115,612	569,178	8,099
1961	89,254	4,612,957	459,325	8,325
1962	91,418	4,797,106	547,787	8,126
1963	101,823	5,762,008	588,046	9,146
1964	97,063	6,140,678	668,274	8,691
1965	99,074	6,164,998	716,950	9,248
1966	105,014	6,552,831	906,009	9,825
1967	107,654	6,232,122	785,907	12,545
1968	106,328	7,774,941	704,241	11,097
1969	109,835	7,884,127	855,336	13,347
1970	115,197	6,945,456	1,225,520	13,620
1971	127,828	7,936,595	860,950	14,627
1972	274,001	11,158,328	955,627	5,290
1973	106,422	6,471,894	1,578,664	4,855
1974	117,990	7,105,606	907,311	5,353
1975	140,940	10,368,738	677,532	5,405
1976	105,184	4,085,126	596,599	15,318
1976-77 (T.Q.)	25,253	1,009,677	220,649	5,849
1977	133,619	4,613,667	921,171	29,101
1978	165,329	5,750,049	1,120,743	12,749
1979	183,585	5,382,230	755,103	11,393
1980	176,385	6,276,964	870,964	11,582

Table C 4.3.--Summary of selected cooperative forest management and processing activities by State--fiscal year 1980

State/ Commonwealth/ Territory	Woodland owners assisted (number)	Area of woodland involved (acres)	Area receiving reforestation and TSI assistance (acres)	Timber sale assistance-- volume harvested (M cu. ft.)	Assists to loggers and processors (number)	Improved utilization (M cu. ft.)	State nursery production (M trees)
Alabama	6,200	197,147	45,980	724	17	9,402	61,000
Alaska	401	802,206	1,481	3,400	37	746	386
Arizona	106	9,941	1,149	230	18	1,993	0
Arkansas	1,579	158,240	47,257	41	26	2,426	17,952
California	3,005	77,873	16,109	1,505	90	8,844	250
Colorado	3,577	50,376	8,143	3,598	356	2,418	2,045
Connecticut	1,863	24,776	4,341	146	52	543	2,358
Delaware	356	11,744	1,865	800	8	699	330
Florida	624	180,206	23,350	1,641	201	3,413	43,762
Georgia	20,189	560,109	30,087	1,473	350	10,103	61,785
Guam	44	100	26	0	2	0	44
Hawaii	433	13,906	317	109	148	409	30
Idaho	1,386	13,960	2,000	1,337	193	1,686	885
Illinois	1,995	30,939	4,863	1,063	168	238	5,800
Indiana	2,622	122,345	15,888	1,909	477	3,949	6,100
Iowa	1,339	33,657	4,534	385	63	555	2,501
Kansas	941	24,673	1,572	456	132	604	959
Kentucky	3,153	84,652	11,949	2,177	32	1,623	12,200
Louisiana	2,696	112,164	19,783	5,226	12	1,652	82,600
Maine	4,648	42,823	8,165	6,711	1,009	3,539	2,210
Maryland	3,072	28,096	5,202	15	26	289	2,707
Massachusetts	3,352	95,439	12,967	3,997	192	3,228	0
Michigan	2,054	108,457	14,266	714	22	978	6,800
Minnesota	7,305	66,229	11,872	3,405	260	3,426	2,986
Mississippi	11,764	213,079	45,117	4,626	875	30,997	76,029
Missouri	4,451	172,436	28,096	4,108	1,080	3,279	11,040
Montana	620	20,843	1,810	13	75	1,133	1,010
Nebraska	484	3,099	349	49	21	1	3,403
Nevada	309	12,191	743	53	2	49	207
New Hampshire	4,762	67,099	8,132	1,835	485	6,397	300
New Jersey	1,866	54,406	12,179	493	86	2,612	842
New Mexico	137	136,350	1,197	1,566	62	1,227	0
New York	6,216	235,370	16,036	7,245	860	4,596	7,789
North Carolina	6,092	449,636	50,482	30,101	76	4,484	47,140
North Dakota	560	11,552	332	9	12	25	1,198
Ohio	5,673	175,219	11,820	939	47	5,043	8,180
Oklahoma	131	14,238	3,168	760	7	65	4,633
Oregon	10,524	455,731	24,020	246	39	11,594	22,500
Pennsylvania	3,503	40,832	7,614	2,035	39	1,843	4,062
Puerto Rico	920	696	380	0	0	0	616
Rhode Island	404	5,637	593	93	3	66	0
South Carolina	3,288	245,558	32,606	10,234	25	3,055	46,400
South Dakota	188	25,845	3,786	924	0	0	950
Tennessee	2,634	120,797	4,392	2,199	28	1,115	20,874
Texas	2,368	170,300	31,285	8,710	1	1,285	26,250
Utah	225	23,002	148	310	73	865	130
Vermont	7,367	57,592	6,018	5,153	34	2,995	285
Virgin Islands	48	31	27	1	0	0	0
Virginia	12,262	384,901	51,448	54,740	3,458	4,620	53,399
Washington	2,857	74,066	9,972	11,182	120	13,530	19,450
West Virginia	3,531	52,682	13,052	2,263	60	4,178	5,043
Wisconsin	10,049	176,408	38,982	19,088	15	1,837	14,313
Wyoming	172	27,310	410	983	108	2,125	0
U.S. Total	176,385	6,276,964	697,360	211,020	11,582	171,780	691,733

Table C 4.4.--Summary of selected cooperative forest management and processing activities by Forest Service Regions and Areas--fiscal year 1980

Assistance activity	Unit of measure	Regions							North-eastern Area	South-eastern Area	Total
		1	2	3	4	5	6	10			
Woodland owners assisted	Number	2,566	5,362	243	534	3,482	13,381	401	73,968	76,448	176,385
Assists to loggers and processors	Number	280	617	80	75	240	159	37	5,108	4,986	11,582
Forest management plans prepared	Number	391	700	140	46	353	3,128	55	26,358	19,714	50,885
	Acres	37,052	42,876	51,629	26,831	48,242	131,471	800,000	2,021,845	1,148,288	4,308,234
Reforestation											
Planting	Acres	705	1,529	940	234	10,164	19,738	275	282,072	62,418	378,075
Seeding	Acres	0	6	0	75	146	0	0	9,052	1,433	10,712
Management for natural regeneration	Acres	175	6,261	0	15	1,274	0	1,200	28,254	39,662	76,841
Timber stand improvement	Acres	3,262	6,464	1,406	567	4,868	14,254	6	77,933	122,972	231,732
Outdoor recreation development	Acres	533	10,156	9,251	2,214	2,348	0	0	77,468	15,597	116,567
Wildlife habitat development	Acres	619	25,196	38,092	3,073	7,585	366	0	72,230	47,325	194,486
Forested range improvement	Acres	1,596	17,450	27,474	2,150	3,365	3,115	0	7,928	260	63,338
Timber sale assistance											
Volume harvested	M cu.ft.	1,359	6,010	1,796	363	1,614	11,428	3,400	122,653	62,397	211,010
Improved utilization											
Harvesting	M cu.ft.	777	3,435	474	565	2,241	11,528	204	15,464	13,419	48,107
Primary processing	M cu.ft.	1,867	614	693	343	5,933	13,596	542	44,245	14,875	82,708
Secondary processing											
and drying	M cu.ft.	200	377	21	5	27	0	0	3,569	9,334	13,533
Fuel and byproducts	M cu.ft.	0	722	2,032	1	1,052	0	0	10,963	12,662	27,434
Urban forestry assistance activities	Urban areas assisted	77	236	17	79	208	95	4	955	1,938	3,609
Referrals to consulting foresters	Number	36	67	10	8	670	313	24	3,386	6,365	10,879

APPENDIX C 5

Table C 5.1.--Wildfires on State and private areas protected under the Cooperative Forestry Assistance Act (P.L. 95-313), Section 7, calendar year 1980

State	Area protected (thousand acres)	Human-caused fires (number)	Human-caused area burned (acres)
Alabama	25,029	5,025	87,541
Alaska	37,134	205	41,990
Arizona	18,823	188	56,371
Arkansas	20,698	2,380	41,234
California	33,089	11,490	300,000
Colorado	23,416	763	2,936
Connecticut	2,390	1,454	2,336
Delaware	557	17	86
Florida	26,243	6,428	99,900
Georgia	27,279	9,380	36,890
Guam	82	552	7,440
Hawaii	3,306	399	1,396
Idaho	7,126	424	13,499
Illinois	8,453	90	3,283
Indiana	7,328	114	483
Iowa	7,612	1,080	11,185
Kansas	19,793	1,635	33,040
Kentucky	17,038	2,339	37,199
Louisiana	20,939	4,984	47,615
Maine	17,743	802	3,848
Maryland	3,700	715	10,514
Massachusetts	3,581	8,416	9,008
Michigan	19,675	465	2,284
Minnesota	22,830	767	8,466
Mississippi	19,858	5,915	70,980
Missouri	15,696	3,722	39,217
Montana	25,866	334	3,435
Nebraska	27,154	1,452	7,586
Nevada	8,777	192	7,930
New Hampshire	4,631	694	458
New Jersey	2,705	1,378	2,917
New Mexico	40,199	132	2,612
New York	16,958	543	2,587
North Carolina	20,817	3,521	30,650
North Dakota	1,553	227	321
Ohio	5,823	957	2,939
Oklahoma	5,087	1,007	20,788
Oregon	13,029	769	6,905
Pennsylvania	19,541	1,529	8,503
Rhode Island	512	680	765
South Carolina	13,289	5,450	18,137
South Dakota	25,816	433	7,688
Tennessee	12,478	2,854	19,713
Texas	22,123	1,260	10,604
Utah	14,724	278	5,539
Vermont	4,638	171	324
Virginia	18,518	2,880	5,587
Washington	13,177	1,147	14,441
West Virginia	12,833	1,938	28,523
Wisconsin	18,898	1,149	1,568
Wyoming	25,540	392	5,054
Total	783,522	101,116	1,184,315

APPENDIX D
RESEARCH PROGRAM

Table D 1.--Forest Service funding--fiscal year 1980

Activity	Appropriation 1980
LAND AND RESOURCE PROTECTION RESEARCH:	(\$ million)
Fire and Atmospheric Science	9.537
Forest Insect and Disease	21.248
Renewable Resources Evaluation	13.627
Renewable Resources Economics	5.031
Surface Environment and Mining	1.645
Subtotal	51.088
RENEWABLE RESOURCES MANAGEMENT AND UTILIZATION RESEARCH:	
Trees and Timber Management	20.057
Forest Watershed Management	9.710
Wildlife, Range and Fish Habitat	8.528
Forest Recreation	2.137
Forest Products Utilization	14.929
Forest Engineering Research	2.346
Subtotal	57.707
TOTAL RESEARCH	108.795

Table D 2.--Summary of extramural research funded by the Forest Service--
fiscal year 1980

Type of Recipient	Cooperative Agreements		Research Grants		Research Contracts		Total	
	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars
Land-Grant Institutions								
Research	311	5,296,521	50	1,491,073	1	3,000	362	6,790,594
SEA/CR 1/	--	--	16	835,430	--	--	16	835,430
1890 Land-Grant and Predominately Black Institution	-6	59,052	--	--	--	--	-6	59,052
Other Non-Land-Grant Institutions	114	1,494,293	17	482,817	3	41,310	134	2,018,420
Subtotal, Universities and Colleges	431	6,849,866	83	2,809,320	4	44,310	518	9,703,493
Non-Profit Institutions and Organizations	13	210,271	7	199,053	--	--	20	409,324
State and Local Government	11	165,238	--	--	--	--	11	165,238
Industrial Firms	3	102,767	--	--	--	--	3	102,767
Private Individuals	5	40,833	--	--	1	17,500	6	58,333
TOTAL, DOMESTIC	463	7,368,975	90	3,008,373	5	61,810	558	10,439,158
Foreign Grantees								
Universities and Colleges	2	13,864	4	156,407	--	--		170,271
Government Agency	1	7,800	1	38,644	--	--	2	46,464
Industrial Firms	--	--	--	--	--	--	--	--
GRAND TOTAL	466	7,390,639		3,203,444	5	61,810	566	10,655,893

1/ Grants executed by Science and Education Administration-Cooperation Research with FS Accelerated Pest Funds

Table D 3.--Summary of extramural research funds received
by the Forest Service--fiscal year 1980

Source of funds	Total dollars
U.S. Department of the Interior	487,418
Environmental Protection Agency	185,516
Department of Energy	93,142
Department of Housing and Urban Development	27,572
State of California	20,500
State of Hawaii	6,580
Troy Chemical Company	3,100
Clark Heritage Fund	<u>46,500</u>
Total	\$870,328

APPENDIX E

PESTICIDE USE ON NATIONAL FOREST SYSTEM LANDS

APPENDIX E

PESTICIDE USE ON NATIONAL FOREST SYSTEM LANDS

Pesticides, including insecticides, herbicides, fungicides, rodenticides, etc., are used by the Forest Service as a component of integrated pest management in the prevention and suppression of insect and disease outbreaks; reduction of unwanted vegetation on range, timber, and recreation lands; control of damaging vertebrate populations, and achievement of other management goals affected by various pests.

Before pesticides are prescribed on National Forest System (NFS) lands, environmental analyses are conducted to determine the best means of meeting specific resource management objectives. Whenever pesticides are determined essential, only those registered by the U.S. Environmental Protection Agency (EPA) are used. Implicit in the EPA registration is the avoidance of unreasonable adverse environmental or human health effects when the pesticides are used in accordance with label directions.

Pesticides are important tools for protecting and enhancing resource values on the approximately 187 million acres of Federal land administered by the Forest Service. An average $\frac{1}{100}$ of 498,113 acres of National Forest System lands are treated annually with pesticides. Of this, 182,829 acres are treated with approximately 412,444 pounds of herbicides, while 315,284 acres are treated with approximately 280,292 pounds of insecticides, acaricides, fungicides, rodenticides, and other pesticides. This represents pesticide applications on less than 1 percent of the total Forest Service land each year. Many acres do not develop conditions requiring treatment; others, once initial conditions are corrected, never need retreatment if properly managed; while still other areas need treatment only once or twice in a 40- to 100-year forest rotation.

No significant adverse environmental effects are known to have occurred in 1980 on National Forest System lands. Although several spill incidents were reported, properly applied cleanup procedures prevented significant adverse effects. Claims of adverse human health effects due to Forest Service applications of pesticides were also reported but these remain unsubstantiated.

The beneficial effects of using pesticides on National Forest System lands are most evident in three general categories: vegetation management, insect and disease prevention and suppression, and animal damage control.

Vegetation Management

Vegetation management is the manipulation of the kinds, amounts, quality, and conditions of the vegetation resource. Forest vegetation management programs range from complete protection of the vegetation resource to intensive management to favor a particular plant species. It is estimated that approximately 39 percent of commercial forest land in the United States is dominated by undesirable vegetation. Significant gains in

¹/ Averages in this report refer to the 5-year pesticide-use from fiscal years 1976-1980.

forest productivity could accrue from increased vegetation management activities on these lands. These activities can be grouped into these eight major categories: noxious weed control, range improvement and maintenance, site preparation for timber production, conifer release, thinning, rights-of-way maintenance, fire protection, and general weed control.

Noxious weed control. Some plant species are noxious or poisonous to humans or animals. Often when forest vegetation is disturbed (as occurs following logging, road and trail construction, and firebreak construction) these plants are encouraged to grow and programs must be undertaken to reduce the noxious farm weeds and control their spread. Herbicide applications are a frequently used method of control. An annual average of 21,200 acres are treated for noxious weeds on National Forest System lands. Noxious weeds treated in 1980 included poison ivy and oak, leafy spurge, dalmation toadflax, thistles, knapweed, wyethia, tansy ragwort, and larkspur.

Range improvement and maintenance. Range improvement and maintenance provides for the orderly improvement of Forest Service administered range that will assist the management, development, and utilization of the range resource for production of livestock in harmony with other resource needs and uses. Some range improvements accomplished with range betterment funds include vegetation management with herbicides which reduce the growth and spread of undesirable species, increasing forage availability and productivity and benefiting livestock and wildlife. Of the nearly 100.5 million acres of range associated with NFS lands, 2/ an average of 123,586 acres are treated annually with pesticides to control such plants as rabbitbrush, sagebrush, juniper, chapparal, manzanita, and shrub oak. The control of these plants helps arrest range deterioration and improve forage conditions with resulting benefits to wildlife, watershed protection, and livestock production.

Site preparation for timber production. A major Forest Service management requirement is regeneration of forest lands to desired timber species within specific time limits. Reestablishing desired tree species following harvest or natural disasters can be difficult because of competing vegetation which can retard or prevent establishment of desired trees.

A variety of techniques, including the use of herbicides, are used for site preparation.

Of the 92 million acres of commercial timber land on the National Forests, about 350-400 thousand acres are treated annually for site preparation. Of this, an average of only 49,424 acres are treated with herbicides. The remainder is accomplished using mechanical, manual, and prescribed burn, or combinations of these activities.

2/ The total of commercial forest and range exceed National Forest areas because some commercial forest is also used as range.

Release. On some sites, competing vegetation may overtop or compete for soil moisture and nutrients thus suppressing the growth of desired species. Control of competing vegetation through the use of herbicides is often required to achieve desired growth rates. The objective of using herbicides to release trees is not necessarily to kill all competitive vegetation, but to increase the amount of light reaching young trees in the understory and decrease competition for soil moisture and nutrients. Given 3 to 5 years of improved light and moisture, young trees on most sites will outgrow the treated competition and be permanently released. The use of herbicides to accomplish release is very important. Compared to other methods of release, the use of herbicides is relatively high, accounting for about two-thirds of the 200 thousand acres treated. Manual release operations are also significant, however.

Thinning. It is often necessary to precommercially thin conifer stands to an optimum density to promote maximum growth of crop trees. The objective of thinning is to: redistribute growth to fewer trees; sanitize stands by removing disease and insect-damaged trees; remove trees of poor vigor or form, or those with defects; increase the general vigor and health of the stand; and provide satisfactory tree distribution patterns. Although manual methods of precommercial thinning predominate on the 300 thousand acres thinned yearly, herbicides are used on an average of 14,192 acres.

Rights-of-way (ROW) maintenance. Rights-of-way across forest lands represent a large land area under management. For example, private powerlines, pipelines, railroads, and highways traverse more than 60 thousand miles of National Forest landscape. In addition, there are 220,000 miles of Forest Service roads that require right-of-way vegetation management. Vegetation management on the ROW's benefit the public by improving vehicle travel safety, esthetics, and by reducing the costs of maintaining the Nation's energy and transportation arteries. Many alternatives are used to accomplish ROW vegetation management. Herbicides are one tool and are used on the average on nearly 10,287 acres of public ROW's.

Fire protection. Fuelbreaks protect all resources of the National Forest System by providing access for wildfire suppression and by creating a discontinuity in the fuel source. They also aid in fireline establishment. Herbicides are used to economically maintain fuelbreaks. An average of 2,822 acres are annually treated for this purpose.

General weed control. The maintenance of recreational, research and administrative facilities often requires general weed control, both aquatic and terrestrial. Nurseries must also be protected from undesirable vegetation in order to produce quality seedlings for future forests. Herbicides are an important tool in these management activities and account for the remainder of uses on NFS lands.

Insect and Disease Prevention and Suppression

Insect control. Populations of both native and introduced insect species cause considerable economic losses to our Nation's forests. The intensity of control efforts used against insects is directly related to the value of the trees at risk and the type of damage. Prevention, through sound forest management, is the first line of defense against forest insects; however, when an outbreak or epidemic occurs, biological, economic, and environmental evaluations may determine that direct control is justified in terms of the value of the forest and human needs. In such cases, insecticides are frequently used. Some of the conventional insecticides most often used for controlling major forest insects are: acephate, carbaryl, malathion, and trichlorfon for forest defoliators; lindane and carbaryl for bark beetles; and carbofuran, acephate, and azinphosmethyl for seed and cone insects. Biological insecticides, including the bacterium Bacillus thuringiensis and viruses specific to the Douglas-fir tussock and gypsy moths, have also been used to reduce populations of these pests and protect foliage. Behavioral chemicals such as attractants, repellents, pheromones, etc., are also beginning to see use in integrated forest insect management programs.

Disease control. Biotic disease agents in National Forests can be of considerable economic importance. As is true for all pests, however, management objectives are of fundamental significance in determining the relative importance of specific diseases and subsequently the need for control. Generally, only forest areas that are intensively managed are subject to control of pathogens. Although most control strategies are cultural, the use of pesticides is important, especially on the several hundred thousand acres of specialty forests such as nurseries, seed orchards, and windbreaks. The most frequently used pesticide for disease control is methyl bromide, a fumigant used to control soil fungi and root rots in nurseries. Benomyl, captan, and chlorothalonil are important fungicides.

Animal Damage Control

Damage from vertebrates on National Forest System lands is usually insignificant compared with their esthetic and recreational value. However, some forest management practices can cause habitat alterations that may lead to abnormal population levels of certain animal species and create conditions that promote local concentrations of potential pests. Most vertebrate damage occurs during the early forest regeneration phase. Important vertebrate pests include deer, elk, bear, rabbits, porcupines, pocket gophers, beaver, and various small rodents. Vertebrate pest populations, especially rodents, are often controlled by using chemical poisons (baits, repellents, predacides, etc.). Strychnine and zinc phosphide are the most used rodenticides. Poisons for controlling vertebrates are usually placed by hand at bait stations, in burrows, or by impregnating conifer seed coats with pesticides to protect the seeds. Animal repellents are also used to protect plantings of new seedlings.

Research

Forest Service research programs include laboratory studies on the microbiology, biochemistry, synthetic and analytical chemistry, toxicology, screening, bioassay, and formulation of potential pesticidal materials. Field research is conducted on efficacy for target pest suppression or protection of trees and stands, environmental safety, and effective application techniques.

The major part of Forest Service research on pesticides is concentrated on herbicides for brush and competition control and insecticides for use against damaging insect pest populations.

Research on other pesticides such as fungicides for control of tree diseases represents a minor part of Forest Service research.

Research on herbicides is aimed toward developing appropriate vegetation control measures that can be used in conjunction with various silvicultural operations to release young conifers from brush and weed tree competition, and to prepare sites for reforestation or interplanting with additional trees. Research includes studies on the behavior and toxicology of herbicides and their effects on the forest environment. Persistence, movement, and breakdown in vegetation, forest floor, soil, and water are also determined.

Research on insecticides is confined chiefly to three main classes of material: (1) the conventional chemical insecticides; (2) novel chemicals such as behavioral modifiers and growth regulators; and (3) non-chemical biological materials represented by the microbial (viruses, bacteria, etc.) insecticides. The behavioral modifiers, growth regulators, and microbials represent alternatives to the traditional chemical toxicants. Alternative materials offer more selective pest control with reduced adverse health and environmental impacts.

Of the novel chemicals, insect pheromones have received the most attention by Forest Service researchers. Pheromones are natural products of insects that function to modify behavior and cause insects to aggregate at a food source or attract the opposite sex for mating.

Summary

The pesticide-use tables in this appendix indicate total pesticide use during fiscal year 1980. The total Forest Service acreage treated with pesticides in fiscal year 1980 was 444,716. Herbicides were used on 229,877 acres, 15 percent of which was applied aerially. Insecticides and acaricides were used on 173,500 acres. The major pests treated were spruce budworm, mountain pine beetle, and rangeland grasshoppers. The latter accounted for 81 percent of the 1980 insecticide applications. The remainder of pesticides uses in 1980 were ground applications of fungicides, rodenticides, algacides, piscicides, repellents, and fumigants.

Table E 1.--Pesticide use report for fiscal year 1980

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>HERBICIDES</u>			
Amitrole	Rights-of-way	1,197.9	368.5
	Noxious weeds	402	328.8
	Conifer release	200	100 (A)
	Hardwood release	54	17
	Grass control	28	4
	General weed control	20	5
Amitrole plus atrazine	Rights-of-way	49.5	4.5
Ammonium sulfamate	General weed control	1,983	173
Asulam	Site preparation	50	15 (A)
	Rights-of-way	24	3
	Bracken fern control	5	7
Atrazine	Site preparation	20,156	4,279 (A)
	Site preparation	3,550	1,396
	Rights-of-way	2,966	471
	General weed control	2,272	688
	Noxious weeds	598	114
	Hardwood release	138	30
	Range improvement	61	116
	Conifer release	31	5
	Research	0.08	0.02
Benefin	Research	1.9	1.9
Bifenox	Conifer release	2	1
	Nursery weed control	1,230	288
Bromacil	Rights-of-way	1,075	202
	General weed control	64	23
Bromacil plus diuron	Rights-of-way	636	147
Cacodylic acid	Rights-of-way	1,127	351
	Hardwood release	57	115
Chlorthal dimethyl	Nursery weed control	1,729	177
	Site preparation	269	19
	Research	26	2

1/ Units treated are expressed in acres unless otherwise indicated. Aerial applications are indicated by (A). All others are ground applications.

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
HERBICIDES (con.)			
Dalapon	Conifer release	4,253	1,195
	Site preparation	3,747	2,603
	General weed control	719	245
	Rights-of-way	345	23
	Noxious weed control	20	2
	Research	1.3	8
DCPA	General weed control	1,019	77
Dicamba	Noxious weeds	2,206	2,077
	Hardwood release	1,025	401
	Range improvement	590	295
	Conifer release	262	820
	Rights-of-way	65	25
	General weed control	34	68
	Site preparation	25	28
Diphenamid	Nursery weed control	486	75
Diquat	Rights-of-way	142	71
	Aquatic weed control	61	30
Diuron	Rights-of-way	1,272	219
	General weed control	32	2
EPTC	General weed control	367	111
Endothall	Aquatic weed control	164	15
Fosamine ammonium	Rights-of-way	3,920	717
	Site preparation	2,728	675 (A)
	Rights-of-way	1,609	156 (A)
	Noxious weed control	43	91
	General weed control	40	10
Glyphosate	Conifer release	6,663	3,204 (A)
	Noxious weed control	844	786
	Site preparation	492	453
	Rights-of-way	470	229
	General weed control	384	176
	Research	317.62	165.73
	Site preparation	256	574 (A)
	Nursery weed control	148	53
	Range improvement	26	27

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>HERBICIDES (con.)</u>			
Hexazinone	Hardwood release	2,161	1,620
	Site preparation	1,304	825
	Conifer release	351	260 (A)
	General weed control	50	46
	Rights-of-way	32	17
	Research	2.04	0.69
Linuron	Research	16.25	100
Maleic hydrazide	Rights-of-way	1,647	1,006
	General weed control	57	30
MCPA	Noxious weed control	173	297
Metolachlor	General weed control	78	57
MSMA	Thinning	300	1,015
	Range improvement	65	349
	Rights-of-way	56	22
Mineral spirits	Nursery weed control	15,615	50
Napropamide	Nursery weed control	366	145
Nitrofen	General weed and grass control	100	10
Oxyfluorfen	Nursery weed control	25	45
Paraquat	General weed control	13	13
Picloram	Site preparation	12,786	34,399
	Noxious weed control	8,781	9,173
	Conifer release	6,166	16,574
	Wildlife habitat improvement	3,814	3,099
	Fire protection	2,737	425
	Thinning	687	2,173
	Range improvement	410	1,523
	Rights-of-way	356	437
	Rights-of-way	71	36 (A)
	Noxious weed control	41	162 (A)
Picloram plus MSMA	Range improvement	305	225
Prometon	Rights-of-way	789	21
	General weed control	93	296

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>HERBICIDES (con.)</u>			
Propazine	General weed control	0.8	10
Simazine	Rights-of-way	3,773	799
	Nursery weed control	519	47.7
	General weed control	244	88
	Site preparation	140	49
	Rights-of-way	60	1,000 poles
	Research	30	20
	Noxious weed control	24	12
Sodium Chlorate	General weed control	239	15
Sodium metaborate tetrahydrate	General weed control	1,100	16
Sodium metaborate plus sodium chlorate	Rights-of-way	3,700	10.9
Tebuthiuron	Range improvement	800	400 (A)
	Range improvement	399	215
	Rights-of-way	392	93
	Noxious weed control	21	50
Treflan	General weed control	1	80
Trichlopyr	Site preparation	158	60
2,4-D	Site preparation	72,393	43,383
	Conifer release	53,454	29,660
	Conifer release	20,738	9,108 (A)
	Range improvement	19,801(A)	12,688 (A)
	Noxious weed control	14,880	9,500
	Wildlife habitat improvement	7,935	4,338
	Range improvement	6,400	2,952
	Thinning	4,783	3,474
	Rights-of-way	2,775	1,039
	Fire protection	864	216 (A)
	Fire protection	444	392
	Aquatic weed control	407	62
	Noxious weed control	324	162 (A)
	Rights-of-way	156	36
	General weed control	136	151
	Nursery weed control	102	13
	Site preparation	84	42 (A)
	Research	0.1	10 trees

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>HERBICIDES (con.)</u>			
2,4-D plus dalapon	Site preparation	355	36 (A)
2,4-D plus dicamba	Wildlife habitat improvement	125	256
	Rights-of-way	39	32
2,4-D plus picloram	Site preparation	5,921	1,259 (A)
	Conifer release	4,465	4,721
	Wildlife habitat improvement	1,461	2,014
	Rights-of-way	477	114
	Site preparation	206	129
	Noxious weed control	89	600
	General weed control	6	3
	Range improvement	2	71
	Research	1	25
	General weed control	42	154
2,4-D plus 2,4-DP	Site preparation	5,594	1,384 (A)
	Rights-of-way	1,245	390
	Rights-of-way	38	3 (A)
2,4-D plus 2,4-DP plus dicamba	Rights-of-way	3	2
2,4,5-T	Noxious weed control	220	55
	Range improvement		
	Research		
Total 1980 Herbicide Use (including aerial use)		371,748.19+	229,876.74+
Total Aerial Use		86,644	34,759

INSECTICIDES

Acephate	Spruce budworm control	3.1	85 trees
Azinphosmethyl	Cone and seed insect control	17,923	24 50,085 trees
<u>Bacillus thuringiensis</u>	Jack pine budworm control	32,112 BIU	4,014 (A)
	Western spruce budworm control	9,600 BIU	1,200 (A)

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>INSECTICIDES (con.)</u>			
<u>Bacillus thuringiensis</u> (con.)	General insect control	24 BIU	3 (A)
	Fruit tree leafroller control	0.5	20
Carbaryl	Grasshopper control	29,000	26,000 (A)
	Mountain pine beetle control	633	2,833 trees
	Elm leaf beetle control	20	50 trees
	Spruce budworm control	10	70
	Cottonwood leaf beetle control	7.2	2
	Rodent flea control	6	20 bait stations 50 burrows
	Bark beetle control	4	14
	Cutworm control	4	2
	General insect control	3	400 trees
	Grasshopper control	0.5	1
	Jeffrey pine beetle control	0.32	2
	Weevil (<u>Polydrusus</u>) control	0.22	4,000 grafts
Carbofuran	Seed and cone insect control	4,223	30,600 trees
	Sugar cane root borer weevil	2	1.5
Chlordane	Termite control	38	2
Chlorpyrifos	Mosquito control	10	192
Coumaphos	Cattle tick and lice control	16.5	184 head cattle
Decis	Jeffrey pine beetle control research	0.0096	4 trees
Diazinon	Cutworm control	72	61
	Bagworm control	9	3
Dimethoate	Pine tip moth control	4.4	6
	Seed insect control	4	20
	Birch leaf miner control	0.5	5 trees

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>INSECTICIDES (con.)</u>			
Ethylene dibromide	Mountain pine beetle control	40	80 cords
Fenvalerate	Cone and insect control	74.4	7.8
Lindane	Balsam woolly aphid control	343	87
	Mountain pine beetle control	50	250 trees
	Southern pine beetle control	43	950 trees
	Tip moth control	5	10
	Western pine beetle control	1.6	2 trees
	Jeffrey pine beetle control	0.24	4 trees
Malathion	Grasshopper control	102,216	141,309 (A)
	Nursery insect control	70	77
	Mosquito control	25	58
	Grasshopper control	23	36
	Windbreak insect control	10	2
	Ash colored blister beetle control	3	3
	Scale insect control	0.1	250 trees
Metasystox	Cone insect control	1	66
Methoxychlor	Cattle tick and lice control	5	5 cattle
Methyl bromide	Town ant control	6	1
Permethrin	Western and mountain pine beetle control research	0.259	2 trees
	Jeffrey pine beetle control research	0.019	4 trees
Petroleum oil	Mosquito control	10	5
Procida	Western and mountain pine beetle control research	0.054	2 trees

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>INSECTICIDES (con.)</u>			
Temephos	Mosquito control	8	143
Tetrachlorvinphos	Tick control	52	58
	Cattle tick and lice control	2	5 dusting stations
Toxaphene	Cattle tick and lice control	1,607	3,030 cattle
<hr/>			
Total 1980 Insecticide Use (including aerial use)		156,590+	173,500+
Total Aerial Use		131,216+	172,526
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<u>FUNGICIDES</u>			
Benomyl	Root rot in nursery	210.9	189.9 478 M seedlings
	Fusarium root disease control	136	34
	Tip blight control	71	50
	Fungi in nursery	32.5	1.5 M seedlings
	Nursery blight control	12.5	5
	Damping off control	6	400 trees
	Cherry leaf spot control	2	400 trees
	Borax	<u>Fomes annosus</u> control	4,429
Captan	Sclerotium control	8	1
	Fungi control	3	1
Chlorothalonil	Scleroderris control	448	224
	Botrytis control	198	65.65
	Brown spot control	18	10
Dazomet	Fusarium control	100	1
Dichloropropene	Nematode and Pythium control	7,056	24

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>FUNGICIDES (con.)</u>			
Ferbam	Fusiform rust control	1,950	50
Maneb	<u>Lophodermium</u> control	169	131
Methyl bromide	Fungi control	15	1 cold frame
Thiophanate-methyl and Etridiazol	Root rot control	2.25	0.5
Thiram	Damping off control	49	1,304 lbs. seed
	Rhizoctonia control research	0.25	1,000 trees
Vorlex	Nematode and Pythium control	5,677	21
Zineb	Shot hole disease control	2.3	1
Total 1980 Fungicide Use		20,596	2,159+
<u>RODENTICIDES</u>			
Diphacinone	Mouse control	8.13	19 bait stations
Methyl bromide	Gopher control	38	200 holes
Sodium nitrate	Pocket gopher control	32	60
Strychnine	Pocket gopher control	761.3	8,582 bait stations
	Mouse control	0.8	10,172 40
Warfarin	Rodent control	36	200 bait stations
Zinc phosphide	Prairie dog control	1,187	19,421
Total 1980 Rodenticide Use		2,063+	29,693+

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>REPELLENTS</u>			
Big game repellent	Deer and elk browse control	1,926.26	8,992
Thiram	Bird and rodent control	796.8	6 22,003 lbs. of seed
Total 1980 Repellent Use		2,723	8,998
<u>PREDACIDES</u>			
Sodium cyanide	Coyote control	0.8878 grams	9 bait stations
Total 1980 Predacide Use		0.0+	0.0
<u>WOOD PRESERVATIVES</u>			
Creosote	Wood rot control	8	Many posts
Pentachlorophenol	Wood rot control	1,556	1,550 posts wood material
Total 1980 Wood Preservative Use		1,564	0.0+
<u>FUMIGANTS</u>			
Dazomet	Soil pest control	5,080	13
Metam-sodium	Soil fungi and nematode control	35	0.13
Methyl bromide	Damping off fungi, weeds, pest control,	37,290	203
	Soil organisms	14	180 seed boxes
Total 1980 Fumigant Use		297+	70,636

Table E 1.--Pesticide use report for fiscal year 1980 (con.)

Common name	Target pest/ purpose	Quantity treated/used	
		Units 1/	Pounds
<u>ALGACIDES</u>			
Copper triethanolamine	Filamentous algae control	3.2	7
Copper sulfate	Algae control	424	10
Benzyl ammonium chlorite	Algae control	2	10,000 sq. ft.
Total 1980 Algacide Use		429	17+
<u>PISICIDES</u>			
Antimycin	Undesirable fish control	7	50 10 miles of stream
Rotenone	Undesirable fish control	626.25	438 acre- feet 206
Total 1980 Pisicide Use		633	256+
GRAND TOTAL PESTICIDE USE		573,781+	444,716

